

# STATE OF NEW HAMPSHIRE INTER-DEPARTMENT COMMUNICATION

**DATE:** November 29, 2021

**FROM:** Andrew O'Sullivan  
Wetlands Program Manager

**AT (OFFICE):** Department of  
Transportation

**SUBJECT** Dredge & Fill Application  
Bedford 43138

**Bureau of  
Environment**

**TO** Karl Benedict, Public Works Permitting Officer  
New Hampshire Wetlands Bureau  
29 Hazen Drive, P.O. Box 95  
Concord, NH 03302-0095

Forwarded herewith is the application package prepared by NH DOT Bureau of Highway Design for the subject major impact project. The project is located along NH Route 114 in the Town of Bedford, NH. The purpose of the project is to address a culvert carrying Bowman Brook under NH Route 114. The existing pipe was constructed in 1964, is corrugated metal and has significant corrosion along the bottom and lower sides. The project would extend the useful life of the culvert through rehabilitation. The culvert is 72" diameter x 119' long and located approximately 475' north of New Boston Road.

This project was reviewed at the Natural Resource Agency Coordination Meeting on September 15, 2021. A copy of the minutes has been included with this application package. A copy of this application and plans can be accessed on the Departments website via the following link: <http://www.nh.gov/dot/org/projectdevelopment/environment/units/program-management/wetland-applications.htm>.

NHDOT anticipates and request that this project be reviewed and permitted by the Army Corp of Engineers through the State Programmatic General Permit process. A copy of the application has been sent to the Army Corp of Engineers.

Mitigation was determined to not be required for this project.

The lead people to contact for this project are Kirk Mudgett, Bureau of Highway Design (271-2171 or Kirk.Mudgett@dot.nh.gov) or Andrew O'Sullivan, Wetlands Program Manager, Bureau of Environment (271-3226 or Andrew.O'Sullivan@dot.nh.gov).

A payment voucher has been processed for this application (Voucher #663608) in the amount of \$1,277.60.

If and when this application meets with the approval of the Bureau, please send the permit directly to Andrew O'Sullivan, Wetlands Program Manager, Bureau of Environment.

AMO:amo  
cc:  
BOE Original  
Town of Bedford (4 copies via certified mail)  
David Trubey, NH Division of Historic Resources (Cultural Review Within)  
Carol Henderson, NH Fish & Game (via electronic notification)  
Maria Tur, US Fish & Wildlife (via electronic notification)  
Beth Alafat & Jeanie Brochi, US Environmental Protection Agency (via electronic notification)  
Michael Hicks & Rick Kristoff, US Army Corp of Engineers (via electronic notification)  
Kevin Nyhan, BOE (via electronic notification)

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**STANDARD DREDGE AND FILL  
WETLANDS PERMIT APPLICATION**  
Water Division/Land Resources Management  
Wetlands Bureau  
[Check the Status of your Application](#)



**RSA/Rule:** RSA 482-A/Env-Wt 100-900

**APPLICANT'S NAME:** NH Dept. of Transportation      **TOWN NAME:** Bedford

Administrative Use Only	Administrative Use Only	Administrative Use Only	File No.:
			Check No.:
			Amount:
			Initials:

A person may request a waiver of the requirements in Rules Env-Wt 100-900 to accommodate situations where strict adherence to the requirements would not be in the best interest of the public or the environment but is still in compliance with RSA 482-A. A person may also request a waiver of the standards for existing dwellings over water pursuant to RSA 482-A:26, III(b). For more information, please consult the [Waiver Request Form](#).

SECTION 1 - REQUIRED PLANNING FOR ALL PROJECTS (Env-Wt 306.05; RSA 482-A:3, I(d)(2))	
Please use the <a href="#">Wetland Permit Planning Tool (WPPT)</a> , the Natural Heritage Bureau (NHB) <a href="#">DataCheck Tool</a> , the <a href="#">Aquatic Restoration Mapper</a> , or other sources to assist in identifying key features such as: <a href="#">priority resource areas (PRAs)</a> , <a href="#">protected species or habitats</a> , coastal areas, designated rivers, or designated prime wetlands.	
Has the required planning been completed?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Does the property contain a PRA? If yes, provide the following information:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<ul style="list-style-type: none"> <li>• Does the project qualify for an Impact Classification Adjustment (e.g. NH Fish and Game Department (NHF&amp;G) and NHB agreement for a classification downgrade) or a Project-Type Exception (e.g. Maintenance or Statutory Permit-by-Notification (SPN) project)? See Env-Wt 407.02 and Env-Wt 407.04.</li> </ul>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<ul style="list-style-type: none"> <li>• Protected species or habitat?                             <ul style="list-style-type: none"> <li>○ If yes, species or habitat name(s): <input type="text"/></li> <li>○ NHB Project ID #: <input type="text"/></li> </ul> </li> </ul>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
• Bog?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
• Floodplain wetland contiguous to a tier 3 or higher watercourse?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
• Designated prime wetland or duly-established 100-foot buffer?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
• Sand dune, tidal wetland, tidal water, or undeveloped tidal buffer zone?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Is the property within a Designated River corridor? If yes, provide the following information:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<ul style="list-style-type: none"> <li>• Name of Local River Management Advisory Committee (LAC): <input type="text"/></li> <li>• A copy of the application was sent to the LAC on Month: <input type="text"/> Day: <input type="text"/> Year: <input type="text"/></li> </ul>	

[irm@des.nh.gov](mailto:irm@des.nh.gov) or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

[www.des.nh.gov](http://www.des.nh.gov)

For dredging projects, is the subject property contaminated? • If yes, list contaminant: <input type="text"/>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Is there potential to impact impaired waters, class A waters, or outstanding resource waters?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
For stream crossing projects, provide watershed size (see <a href="#">WPPT</a> or Stream Stats): <input type="text"/> Streamstats 2,022 AC (not used) LIDAR 1,986 AC	
<b>SECTION 2 - PROJECT DESCRIPTION (Env-Wt 311.04(i))</b>	
Provide a <b>brief</b> description of the project and the purpose of the project, outlining the scope of work to be performed and whether impacts are temporary or permanent. DO NOT reply "See attached"; please use the space provided below.	
<p>The purpose of the project is to address a culvert carrying Bowman Brook under NH Route 114. The existing pipe was constructed in 1964, is corrugated metal and has significant corrosion along the bottom and lower sides. The project would extend the useful life of the culvert through rehabilitation. The culvert is 72" diameter x 119' long and located approximately 475' north of New Boston Road. The proposed design is to slipline the full length of the existing culvert with a cured in place liner. A clean water bypass, most likely through the pipe, will be used during construction. The existing structure will be cleaned, inspected, and repaired by grouting voids before the cured in place slipline treatment is installed. Incidental work will include minor repairs to the mortared stone headwalls at the inlet and outlet, and filling of sinkholes behind the headwalls.</p>	
<b>SECTION 3 - PROJECT LOCATION</b>	
Separate wetland permit applications must be submitted for each municipality within which wetland impacts occur.	
ADDRESS: <input type="text"/> NH 114, 475' north of New Boston Road.	
TOWN/CITY: <input type="text"/> Bedford, NH	
TAX MAP/BLOCK/LOT/UNIT: <input type="text"/> N/A	
US GEOLOGICAL SURVEY (USGS) TOPO MAP WATERBODY NAME: <input type="text"/> Bowman Brook <input type="checkbox"/> N/A	
(Optional) LATITUDE/LONGITUDE in decimal degrees (to five decimal places): <input type="text"/> 42.96970° North <input type="text"/> 71.50962° West	

<b>SECTION 4 - APPLICANT (DESIRED PERMIT HOLDER) INFORMATION (Env-Wt 311.04(a))</b>		
If the applicant is a trust or a company, then complete with the trust or company information.		
NAME: NH Dept. of Transportation		
MAILING ADDRESS: PO Box 483		
TOWN/CITY: Concord	STATE: NH	ZIP CODE: 03303
EMAIL ADDRESS: Kirk.Mudgett@dot.nh.gov		
FAX: [REDACTED]	PHONE: 603-271-1598	
ELECTRONIC COMMUNICATION: By initialing here: KM, I hereby authorize NHDES to communicate all matters relative to this application electronically. <i>KOM</i>		
<b>SECTION 5 - AUTHORIZED AGENT INFORMATION (Env-Wt 311.04(c))</b>		
<input type="checkbox"/> N/A		
LAST NAME, FIRST NAME, M.I.: [REDACTED]		
COMPANY NAME: [REDACTED]		
MAILING ADDRESS: [REDACTED]		
TOWN/CITY: [REDACTED]	STATE: [REDACTED]	ZIP CODE: [REDACTED]
EMAIL ADDRESS: [REDACTED]		
FAX: [REDACTED]	PHONE: [REDACTED]	
ELECTRONIC COMMUNICATION: By initialing here [REDACTED], I hereby authorize NHDES to communicate all matters relative to this application electronically.		
<b>SECTION 6 - PROPERTY OWNER INFORMATION (IF DIFFERENT THAN APPLICANT) (Env-Wt 311.04(b))</b>		
If the owner is a trust or a company, then complete with the trust or company information.		
<input checked="" type="checkbox"/> Same as applicant		
NAME: [REDACTED]		
MAILING ADDRESS: [REDACTED]		
TOWN/CITY: [REDACTED]	STATE: [REDACTED]	ZIP CODE: [REDACTED]
EMAIL ADDRESS: [REDACTED]		
FAX: [REDACTED]	PHONE: [REDACTED]	
ELECTRONIC COMMUNICATION: By initialing here [REDACTED], I hereby authorize NHDES to communicate all matters relative to this application electronically.		

**SECTION 7 - RESOURCE-SPECIFIC CRITERIA ESTABLISHED IN Env-Wt 400, Env-Wt 500, Env-Wt 600, Env-Wt 700, OR Env-Wt 900 HAVE BEEN MET (Env-Wt 313.01(a)(3))**

Describe how the resource-specific criteria have been met for each chapter listed above (please attach information about stream crossings, coastal resources, prime wetlands, or non-tidal wetlands and surface waters):

Env-Wt 400: Per RSA 310-A:79 - Exemption III, jurisdictional areas were delineated and classified in accordance with the requirements of Env-Wt 400 on June 24, 2021 by Sarah Large and Rebecca Martin. The jurisdictional areas are referenced on the attached included wetland impact plans.

Env-Wt 500: No docking structures or marinas are proposed. No bank or shoreline stabilization (Env-Wt 514) is proposed. No boardwalks, pond creation or forestry activities are proposed. No agricultural activities are proposed. No dredging is proposed. No development is proposed. No restoration activities are proposed.

Env-Wt 527 Public Highways does apply to this project. The project has been designed in accordance with Env-Wt 527, and Env-Wt 900 to the maximum extent practicable. The project will not increase flooding off-site or cause stream diversion that would impact adjacent property owners. The application includes technical details as well as details within the supplemental narrative to address Env-Wt 904.09 which includes Repair of Existing Legal Tier 3 Crossings. Unavoidable impacts to wetlands have been minimized to the maximum extent practicable. Project specific information is contained within this permit application.

There are no coastal lands or tidal waters in the project area, so Env-Wt 600 and Env-Wt 700 do not apply to this project.

**SECTION 8 - AVOIDANCE AND MINIMIZATION**

Impacts within wetland jurisdiction must be avoided to the maximum extent practicable (Env-Wt 313.03(a)).\* Any project with unavoidable jurisdictional impacts must then be minimized as described in the [Wetlands Best Management Practice Techniques For Avoidance and Minimization](#) and the [Wetlands Permitting: Avoidance, Minimization and Mitigation Fact Sheet](#). For minor or major projects, a functional assessment of all wetlands on the project site is required (Env-Wt 311.03(b)(10)).\*

Please refer to the application checklist to ensure you have attached all documents related to avoidance and minimization, as well as functional assessment (where applicable). Use the [Avoidance and Minimization Checklist](#), the [Avoidance and Minimization Narrative](#), or your own avoidance and minimization narrative.

\*See Env-Wt 311.03(b)(6) and Env-Wt 311.03(b)(10) for shoreline structure exemptions.

**SECTION 9 - MITIGATION REQUIREMENT (Env-Wt 311.02)**

If unavoidable jurisdictional impacts require mitigation, a mitigation [pre-application meeting](#) must occur at least 30 days but not more than 90 days prior to submitting this Standard Dredge and Fill Permit Application.

Mitigation Pre-Application Meeting Date: Month: 9 Day: 15 Year: 2021

N/A - Mitigation is not required

**SECTION 10 - THE PROJECT MEETS COMPENSATORY MITIGATION REQUIREMENTS (Env-Wt 313.01(a)(1)c)**

Confirm that you have submitted a compensatory mitigation proposal that meets the requirements of Env-Wt 800 for all permanent unavoidable impacts that will remain after avoidance and minimization techniques have been exercised to the maximum extent practicable:  I confirm submittal.

N/A – Compensatory mitigation is not required

**SECTION 11 - IMPACT AREA (Env-Wt 311.04(g))**

For each jurisdictional area that will be/has been impacted, provide square feet (SF) and, if applicable, linear feet (LF) of impact, and note whether the impact is after-the-fact (ATF; i.e., work was started or completed without a permit).

For intermittent and ephemeral streams, the linear footage of impact is measured along the thread of the channel. *Please note, installation of a stream crossing in an ephemeral stream may be undertaken without a permit per Rule Env-Wt 309.02(d), however other dredge or fill impacts should be included below.*

For perennial streams/ivers, the linear footage of impact is calculated by summing the lengths of disturbances to the channel and banks.

Permanent impacts are impacts that will remain after the project is complete (e.g., changes in grade or surface materials).

Temporary impacts are impacts not intended to remain (and will be restored to pre-construction conditions) after the project is completed.

JURISDICTIONAL AREA		PERMANENT			TEMPORARY		
		SF	LF	ATF	SF	LF	ATF
Wetlands	Forested Wetland			<input type="checkbox"/>			<input type="checkbox"/>
	Scrub-shrub Wetland			<input type="checkbox"/>			<input type="checkbox"/>
	Emergent Wetland			<input type="checkbox"/>	1547		<input type="checkbox"/>
	Wet Meadow			<input type="checkbox"/>			<input type="checkbox"/>
	Vernal Pool			<input type="checkbox"/>			<input type="checkbox"/>
	Designated Prime Wetland			<input type="checkbox"/>			<input type="checkbox"/>
	Duly-established 100-foot Prime Wetland Buffer			<input type="checkbox"/>			<input type="checkbox"/>
Surface Water	Intermittent / Ephemeral Stream			<input type="checkbox"/>			<input type="checkbox"/>
	Perennial Stream or River			<input type="checkbox"/>	1009	40	<input type="checkbox"/>
	Lake / Pond			<input type="checkbox"/>			<input type="checkbox"/>
	Docking - Lake / Pond			<input type="checkbox"/>			<input type="checkbox"/>
	Docking - River			<input type="checkbox"/>			<input type="checkbox"/>
Banks	Bank - Intermittent Stream			<input type="checkbox"/>			<input type="checkbox"/>
	Bank - Perennial Stream / River			<input type="checkbox"/>	638	96	<input type="checkbox"/>
	Bank / Shoreline - Lake / Pond			<input type="checkbox"/>			<input type="checkbox"/>
Tidal	Tidal Waters			<input type="checkbox"/>			<input type="checkbox"/>
	Tidal Marsh			<input type="checkbox"/>			<input type="checkbox"/>
	Sand Dune			<input type="checkbox"/>			<input type="checkbox"/>
	Undeveloped Tidal Buffer Zone (TBZ)			<input type="checkbox"/>			<input type="checkbox"/>
	Previously-developed TBZ			<input type="checkbox"/>			<input type="checkbox"/>
	Docking - Tidal Water			<input type="checkbox"/>			<input type="checkbox"/>
<b>TOTAL</b>					<b>3194</b>	<b>136</b>	

**SECTION 12 - APPLICATION FEE (RSA 482-A:3, I)**

**MINIMUM IMPACT FEE:** Flat fee of \$400.

**NON-ENFORCEMENT RELATED, PUBLICLY-FUNDED AND SUPERVISED RESTORATION PROJECTS, REGARDLESS OF IMPACT CLASSIFICATION:** Flat fee of \$400 (refer to RSA 482-A:3, 1(c) for restrictions).

**MINOR OR MAJOR IMPACT FEE:** Calculate using the table below:

Permanent and temporary (non-docking):	3194 SF	× \$0.40 =	\$ 1,277.60
Seasonal docking structure:	SF	× \$2.00 =	\$
Permanent docking structure:	SF	× \$4.00 =	\$
Projects proposing shoreline structures (including docks) add \$400 =			\$

	Total = \$ 1,277.60
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**The application fee for minor or major impact is the above calculated total or \$400, whichever is greater = \$ 1,277.60**

**SECTION 13 - PROJECT CLASSIFICATION (Env-Wt 306.05)**  
 Indicate the project classification.

<input type="checkbox"/> Minimum Impact Project	<input type="checkbox"/> Minor Project	<input checked="" type="checkbox"/> Major Project
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**SECTION 14 - REQUIRED CERTIFICATIONS (Env-Wt 311.11)**

**Initial each box below to certify:**

Initials: KOM _____ _____	To the best of the signer's knowledge and belief, all required notifications have been provided.
------------------------------------	--

Initials: KOM _____ _____	The information submitted on or with the application is true, complete, and not misleading to the best of the signer's knowledge and belief.
------------------------------------	--

Initials: KOM _____ _____	The signer understands that: <ul style="list-style-type: none"> <li>• The submission of false, incomplete, or misleading information constitutes grounds for NHDES to:                         <ol style="list-style-type: none"> <li>1. Deny the application.</li> <li>2. Revoke any approval that is granted based on the information.</li> <li>3. If the signer is a certified wetland scientist, licensed surveyor, or professional engineer licensed to practice in New Hampshire, refer the matter to the joint board of licensure and certification established by RSA 310-A:1.</li> </ol> </li> <li>• The signer is subject to the penalties specified in New Hampshire law for falsification in official matters, currently RSA 641.</li> <li>• The signature shall constitute authorization for the municipal conservation commission and the Department to inspect the site of the proposed project, except for minimum impact forestry SPN projects and minimum impact trail projects, where the signature shall authorize only the Department to inspect the site pursuant to RSA 482-A:6, II.</li> </ul>
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Initials: KOM _____ _____	If the applicant is not the owner of the property, each property owner signature shall constitute certification by the signer that he or she is aware of the application being filed and does not object to the filing.
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**SECTION 15 - REQUIRED SIGNATURES (Env-Wt 311.04(d); Env-Wt 311.11)**

SIGNATURE (OWNER): 	PRINT NAME LEGIBLY: NHDOT/Kirk Mudgett	DATE: 11-17-21
SIGNATURE (APPLICANT, IF DIFFERENT FROM OWNER): _____	PRINT NAME LEGIBLY: _____	DATE: _____
SIGNATURE (AGENT, IF APPLICABLE): _____	PRINT NAME LEGIBLY: _____	DATE: _____

**SECTION 16 - TOWN / CITY CLERK SIGNATURE (Env-Wt 311.04(f))**

As required by RSA 482-A:3, I(a)(1), I hereby certify that the applicant has filed four application forms, four detailed plans, and four USGS location maps with the town/city indicated below.	
TOWN/CITY CLERK SIGNATURE: [REDACTED]	PRINT NAME LEGIBLY: State agency exempt per RSA 482-A:3, I(a)
TOWN/CITY: 4 copies via cert. mail	DATE: exempt per Env-Wt 311.05(a)(14)

**DIRECTIONS FOR TOWN/CITY CLERK:**

Per RSA 482-A:3, I(a)(1)

1. IMMEDIATELY sign the original application form and four copies in the signature space provided above.
2. Return the signed original application form and attachments to the applicant so that the applicant may submit the application form and attachments to NHDES by mail or hand delivery.
3. IMMEDIATELY distribute a copy of the application with one complete set of attachments to each of the following bodies: the municipal Conservation Commission, the local governing body (Board of Selectmen or Town/City Council), and the Planning Board.
4. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

**DIRECTIONS FOR APPLICANT:**

Submit the original permit application form bearing the signature of the Town/City Clerk, additional materials, and the application fee to NHDES by mail or hand delivery at the address at the bottom of this page. Make check or money order payable to "Treasurer – State of NH".

Keep this checklist for your reference; do not submit with your application.

### APPLICATION CHECKLIST

Unless specified, all items below are required. Failure to provide the required items will delay a decision on your project and may result in denial of your application. Please reference statute RSA 482-A, Fill and Dredge in Wetlands, and the [Wetland Rules Env-Wt 100-900](#).

- The completed, dated, signed, and certified application (Env-Wt 311.03(b)(1)).
- Correct fee as determined in RSA 482-A:3, I(b) or (c), subject to any cap established by RSA 482-A:3, X (Env-Wt 311.03(b)(2)). Make check or money order payable to "Treasurer – State of NH".
- The Required Planning actions required by Env-Wt 311.01(a)-(c) and Env-Wt 311.03(b)(3).
- [US Army Corps of Engineers \(ACE\) "Appendix B, New Hampshire General Permits \(GPs\), Required Information and Corps Secondary Impacts Checklist"](#) and its required attachments (Env-Wt 307.02). This includes the [US Fish and Wildlife Service IPAC review](#) and [Section 106 Historic/Archaeological Resource review](#).
- Project plans described in Env-Wt 311.05 (Env-Wt 311.03(b)(4)).
- Maps, or electronic shape files and meta data, and other attachments specified in Env-Wt 311.06 (Env-Wt 311.03(b)(5)).
- Explanation of the methods, timing, and manner as to how the project will meet standard permit conditions required in Env-Wt 307 (Env-Wt 311.03(b)(7)).
- If applicable, the information regarding proposed compensatory mitigation specified in Env-Wt 311.08 and Chapter Env-Wt 800 - [Permittee Responsible Mitigation Project Worksheet](#), unless not required under Env-Wt 313.04 (Env-Wt 311.03(b)(8); Env-Wt 311.08; Env-Wt 313.04).
- Any additional information specific to the **type of resource** as specified in Env-Wt 311.09 (Env-Wt 311.03(b)(9); Env-Wt 311.04(j)).
- Project specific information required by Env-Wt 500, Env-Wt 600, and Env-Wt 900 (Env-Wt 311.03(b)(11)).
- A list containing the name, mailing address and tax map/lot number of each abutter to the subject property (Env-Wt 311.03(b)(12)).
- Copies of certified postal receipts or other proof of receipt of the notices that are required by RSA 482-A:3, I(d) (Env-Wt 311.03(b)(13)).
- Project design considerations required by Env-Wt 313 (Env-Wt 311.04(j)).
- Town tax map showing the subject property, the location of the project on the property, and the location of properties of abutters with each lot labeled with the name and mailing address of the abutter (Env-Wt 311.06(a)).
- Dated and labeled color photographs that:
  - (1) Clearly depict:
    - a. All jurisdictional areas, including but not limited to portions of wetland, shoreline, or surface water where impacts have or are proposed to occur.
    - b. All existing shoreline structures.
  - (2) Are mounted or printed no more than 2 per sheet on 8.5 x 11 inch sheets (Env-Wt 311.06(b)).
- A copy of the appropriate US Geological Survey map or updated data based on LiDAR at a scale of one inch equals 2,000 feet showing the location of the subject property and proposed project (Env-Wt 311.06(c)).
- A narrative that describes the work sequence, including pre-construction through post-construction, and the relative timing and progression of all work (Env-Wt 311.06(d)).

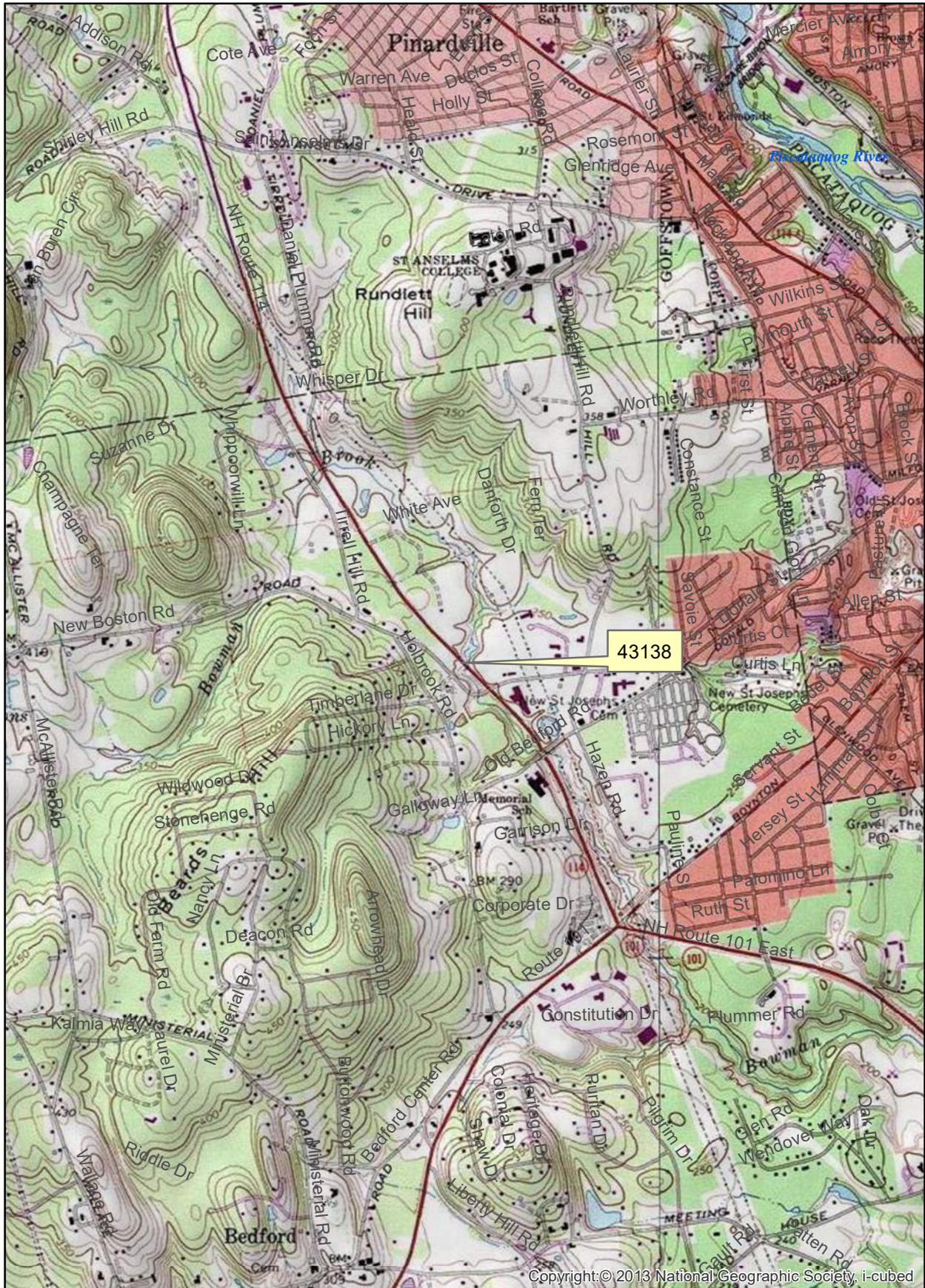
[lrn@des.nh.gov](mailto:lrn@des.nh.gov) or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

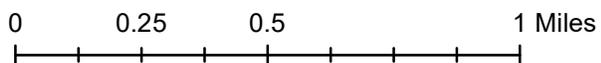
[www.des.nh.gov](http://www.des.nh.gov)

- For all projects in the protected tidal zone, a copy of the recorded deed with book and page numbers for the property (Env-Wt 311.06(e)).
  - If the applicant is not the owner in fee of the subject property, documentation of the applicant's legal interest in the subject property, provided that for utility projects in a utility corridor, such documentation may comprise a list that:
    - (1) Identifies the county registry of deeds and book and page numbers of all of the easements or other recorded instruments that provide the necessary legal interest; and
    - (2) Has been certified as complete and accurate by a knowledgeable representative of the applicant (Env-Wt 311.06(f)).
  - The NHB memo containing the NHB identification number and results as well as any written follow-up communications such as additional memos or email communications with either NHB or NHF&G (Env-Wt 311.06(g)). See [Wetlands Permitting: Protected Species and Habitat Fact Sheet](#).
  - A statement of whether the applicant has received comments from the local conservation commission and, if so, how the applicant has addressed the comments (Env-Wt 311.06(h)).
  - For projects in LAC jurisdiction, a statement of whether the applicant has received comments from the LAC and, if so, how the applicant has addressed the comments (Env-Wt 311.06(i)).
  - If the applicant is also seeking to be covered by the state general permits, a statement of whether comments have been received from any federal agency and, if so, how the applicant has addressed the comments (Env-Wt 311.06(j)).
  - [Avoidance and Minimization Written Narrative](#) or the [Avoidance and Minimization Checklist](#), or your own avoidance and minimization narrative (Env-Wt 311.07).
  - For after-the-fact applications: information required by Env-Wt 311.12.
  - [Coastal Resource Worksheet](#) for coastal projects as required under Env-Wt 600.
  - Prime Wetlands information required under Env-Wt 700. See [WPPT](#) for prime wetland mapping.
- Required Attachments for Minor and Major Projects**
- [Attachment A: Minor and Major Projects](#) (Env-Wt 313.03).
  - [Functional Assessment Worksheet](#) or others means of documenting the results of actions required by Env-Wt 311.10 as part of an application preparation for a standard permit (Env-Wt 311.03(b)(3); Env-Wt 311.03(b)(10)). See [Functional Assessments for Wetlands and Other Aquatic Resources Fact Sheet](#). For shoreline structures, see shoreline structures exemption in Env-Wt 311.03(b)(10)).
- Optional Materials**
- [Stream Crossing Worksheet](#) which summarizes the requirements for stream crossings under Env-Wt 900.
  - Request for [concurrent processing of related shoreland / wetlands permit applications](#) (Env-Wt 313.05).

# Bedford 43138 Topo



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1:24,000



**STANDARD DREDGE AND FILL  
WETLANDS PERMIT APPLICATION  
ATTACHMENT A: MINOR AND MAJOR PROJECTS**



Water Division/Land Resources Management  
Wetlands Bureau

[Check the Status of your Application](#)

**RSA/ Rule:** RSA 482-A/ Env-Wt 311.10; Env-Wt 313.01(a)(1); Env-Wt 313.03

**APPLICANT'S NAME:** NH Dept. of Transportation      **TOWN NAME:** Bedford

Attachment A is required for *all minor and major projects*, and must be completed *in addition* to the [Avoidance and Minimization Narrative](#) or [Checklist](#) that is required by Env-Wt 307.11.

For projects involving construction or modification of non-tidal shoreline structures over areas of surface waters having an absence of wetland vegetation, only Sections I.X through I.XV are required to be completed.

**PART I: AVOIDANCE AND MINIMIZATION**

In accordance with Env-Wt 313.03(a), the Department shall not approve any alteration of any jurisdictional area unless the applicant demonstrates that the potential impacts to jurisdictional areas have been avoided to the maximum extent practicable and that any unavoidable impacts have been minimized, as described in the [Wetlands Best Management Practice Techniques For Avoidance and Minimization](#).

**SECTION I.I - ALTERNATIVES (Env-Wt 313.03(b)(1))**

Describe how there is no practicable alternative that would have a less adverse impact on the area and environments under the Department's jurisdiction.

THE PURPOSE OF THE PROJECT IS TO ADDRESS THE FAILING CULVERT QUICKLY TO AVOID ANY LASTING DAMAGE OR RISK TO THE ROADWAY. THE REHABILITATION OPTION BEST MEETS THE PROJECT PURPOSE, BUDGET AND SCHEDULE.

A FULLY COMPLIANT STREAM CROSSING DESIGN WOULD INVOLVE REPLACING THE EXISTING 72" CMP CULVERT WITH A 36' SPAN BRIDGE. THE CURRENT CONSTRUCTION COST ESTIMATE FOR THIS OPTION IS \$3,626,350. SIGNIFICANT TEMPORARY WIDENINGS AND ASSOCIATED UTILITY AND WETLAND IMPACTS WOULD BE REQUIRED ON BOTH SIDES OF NH 114 IN ORDER TO MAINTAIN TWO-WAY TRAFFIC. LOSS OF FLOOD STORAGE WOULD HAVE A SIGNIFICANT IMPACT ON DOWNSTREAM STRUCTURES AND THE BOWMAN BROOK CHANNEL. FOR THE 100 YEAR STORM, FLOW TRANSFERRED DOWNSTREAM WOULD INCREASE FROM 427 CFS TO JUST OVER 1,200 CFS. SECURING FUNDING AND ADDITIONAL DESIGN TIME FOR THIS OPTION WOULD REQUIRE A DELAY IN THE START OF CONSTRUCTION OF 3 – 5 YEARS. A DELAY OF THIS MAGNITUDE WOULD SIGNIFICANTLY INCREASE THE RISK OF DEFORMATION OR FAILURE OF THE EXISTING PIPE AND POTENTIAL SINKHOLES DEVELOPING IN THE DEEP EMBANKMENT FILL.

A HYDRAULIC DESIGN WAS ALSO CONSIDERED, THAT WOULD PASS THE 50 YEAR STORM WITHOUT SUBMERGING THE INLET. THIS WOULD BE A 12' SPAN X 8' HIGH (CLEAR OPENING) EMBEDDED BOX CULVERT. THE CURRENT CONSTRUCTION COST ESTIMATE FOR THIS OPTION IS \$2,000,233. THE EXTENT OF THE IMPACTS AND DELAY IN CONSTRUCTION WOULD BE SIMILAR TO THE COMPLIANT SPAN OPTION.

NONE OF THE REPLACEMENT ALTERNATIVES MEET THE PROJECT OBJECTIVE OF A TIMELY STRUCTURAL REPAIR WHILE BALANCING EFFECTS ON CAPACITY, VELOCITY, AND OTHER RESOURCES. REHABILITATION IS THE LEAST IMPACT PRACTICABLE ALTERNATIVE. THE PROPOSED CURED IN PLACE LINER IS THE LEAST IMPACT REHABILITATION METHOD.

[irm@des.nh.gov](mailto:irm@des.nh.gov) or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

[www.des.nh.gov](http://www.des.nh.gov)

**SECTION I.II - MARSHES (Env-Wt 313.03(b)(2))**

Describe how the project avoids and minimizes impacts to tidal marshes and non-tidal marshes where documented to provide sources of nutrients for finfish, crustacean, shellfish, and wildlife of significant value.

N/A - no marshes in the project area

**SECTION I.III - HYDROLOGIC CONNECTION (Env-Wt 313.03(b)(3))**

Describe how the project maintains hydrologic connections between adjacent wetland or stream systems.

The existing culvert provides a hydrologic connection between the upstream and downstream channels of Bowman Brook. There is no existing perch at the inlet or outlet. The invert of the proposed cured in place liner will be about 15mm (0.59") higher than the existing culvert invert. This small raise in invert will have no effect on hydrologic conditions. The proposed liner will maintain the existing hydrologic connection and match the existing flow conditions to the maximum extent practicable.

**SECTION I.IV - JURISDICTIONAL IMPACTS (Env-Wt 313.03(b)(4))**

Describe how the project avoids and minimizes impacts to wetlands and other areas of jurisdiction under RSA 482-A, especially those in which there are exemplary natural communities, vernal pools, protected species and habitat, documented fisheries, and habitat and reproduction areas for species of concern, or any combination thereof.

The project has been designed in accordance with ENV-Wt 400, 500, and 900. Unavoidable impacts to wetlands have been minimized to the maximum extent practicable; the Department has addressed Env-Wt 311.07 Avoidance and Minimization through the checklist document included with this application.

There are no vernal pools, exemplary natural communities, or State listed species known to occur in the project area. The project is within the range of the Northern Long Eared Bat. Bowman Brook is considered Essential Fish Habitat for Atlantic salmon. Information for the preferred alternative was sent to NOAA on 7/26/21. No conservation measures were recommended.

The NH Natural Heritage Bureau reviewed the project area for records of protected species and exemplary natural communities near the project area and found a record, but no impacts are expected based on the proposed scope of work.

There are two Federal or State listed endangered or threatened species that may be in the project area: the Northern Long Eared Bat, and the Small-Whorled Pogonia (SWP). The US Fish and Wildlife Service (USFW) Information for Planning and Conservation webtool was used to determine that the project qualifies for the December 15, 2016 FHWA Range-wide Programmatic Biological Opinion for NLEB and the project has a May Affect, Likely to Adversely Affect determination due to the need to clear trees during the NLEB active season. All appropriate Avoidance and Minimization Measures will be included in the contract document and no further consultation is anticipated. The USFWS has concurred that the project area does not appear to contain Small Whorled Pogonia habitat.

**SECTION I.V - PUBLIC COMMERCE, NAVIGATION, OR RECREATION (Env-Wt 313.03(b)(5))**

Describe how the project avoids and minimizes impacts that eliminate, depreciate or obstruct public commerce, navigation, or recreation.

The proposed design/work will allow traffic to continue to flow on NH 114 during construction minimizing the impact to local and regional commuting and commerce. In the project area, Bowman Brook is not used for water recreation nor is it an identified fishing location. The site is not a suitable nor feasible recreation area and therefore the level of impact to recreation will be minimal to none.

**SECTION I.VI - FLOODPLAIN WETLANDS (Env-Wt 313.03(b)(6))**

Describe how the project avoids and minimizes impacts to floodplain wetlands that provide flood storage.

The proposed rehabilitation will not have any permanent effect on floodplain wetlands. As defined by Env-Wt 103.10 and Env-Wt 102.01 floodplain wetlands are wetlands located within a 100-year floodplain, as identified by FEMA's FIRM maps. Bowman Brook is in the FEMA zone AE and the area upstream of the culvert is delineated as a permanently flooded palustrine emergent wetland within the floodplain within the project area.

Permanent impacts to the floodplain wetland have been avoided. The temporary impacts proposed are the minimum necessary to provide access to the culvert inlet and to install a water diversion structure. All temporary impacts will be restored to their original condition post construction per Env-Wt 307.12.

**SECTION I.VII - RIVERINE FORESTED WETLAND SYSTEMS AND SCRUB-SHRUB – MARSH COMPLEXES (Env-Wt 313.03(b)(7))**

Describe how the project avoids and minimizes impacts to natural riverine forested wetland systems and scrub-shrub – marsh complexes of high ecological integrity.

Avoidance of all impacts is not practicable due to the poor structural condition of the existing culvert. The proposed design has the least impact to wetlands of any practicable alternative.

The impacts to wetlands in the project area are temporary and will not have a permanent effect on the functions and values of these wetlands. Proposed impacts are the minimum necessary to allow for access to the culvert outlet and to install appropriate erosion and turbidity controls.

There are no proposed impacts to forested wetlands, scrub-shrub wetlands or marshes.

**SECTION I.VIII - DRINKING WATER SUPPLY AND GROUNDWATER AQUIFER LEVELS (Env-Wt 313.03(b)(8))**

Describe how the project avoids and minimizes impacts to wetlands that would be detrimental to adjacent drinking water supply and groundwater aquifer levels.

The project will have no effect on wetlands that would be detrimental to adjacent drinking water supply and groundwater aquifer levels. Best Management Practices will be used during construction to protect water quality.

**SECTION I.IX - STREAM CHANNELS (Env-Wt 313.03(b)(9))**

Describe how the project avoids and minimizes adverse impacts to stream channels and the ability of such channels to handle runoff of waters.

The project includes only the minimum necessary temporary impacts to the downstream channel and banks. The slightly smaller diameter of the cured in place liner will not have a significant impact on the outlet velocity or surface water elevations. The stream channel will continue to capture, contain, and convey stormwater runoff in the same manner as it does today. The surrounding landscape topography will not be changed as a result of this project, therefore stormwater runoff will enter the stream system the same way it currently does.

**SECTION I.X - SHORELINE STRUCTURES - CONSTRUCTION SURFACE AREA (Env-Wt 313.03(c)(1))**

Describe how the project has been designed to use the minimum construction surface area over surface waters necessary to meet the stated purpose of the structures.

N/A - The project does not involve shoreline structures.

**SECTION I.XI - SHORELINE STRUCTURES - LEAST INTRUSIVE UPON PUBLIC TRUST (Env-Wt 313.03(c)(2))**

Describe how the type of construction proposed is the least intrusive upon the public trust that will ensure safe docking on the frontage.

N/A

**SECTION I.XII - SHORELINE STRUCTURES – ABUTTING PROPERTIES (Env-Wt 313.03(c)(3))**

Describe how the structures have been designed to avoid and minimize impacts on ability of abutting owners to use and enjoy their properties.

N/A

**SECTION I.XIII - SHORELINE STRUCTURES – COMMERCE AND RECREATION (Env-Wt 313.03(c)(4))**

Describe how the structures have been designed to avoid and minimize impacts to the public's right to navigation, passage, and use of the resource for commerce and recreation.

N/A

**SECTION I.XIV - SHORELINE STRUCTURES – WATER QUALITY, AQUATIC VEGETATION, WILDLIFE AND FINFISH HABITAT (Env-Wt 313.03(c)(5))**

Describe how the structures have been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.

N/A

**SECTION I.XV - SHORELINE STRUCTURES – VEGETATION REMOVAL, ACCESS POINTS, AND SHORELINE STABILITY (Env-Wt 313.03(c)(6))**

Describe how the structures have been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.

N/A

<b>PART II: FUNCTIONAL ASSESSMENT</b>	
<b>REQUIREMENTS</b>	Ensure that project meets the requirements of Env-Wt 311.10 regarding functional assessment (Env-Wt 311.04(j); Env-Wt 311.10).
<b>FUNCTIONAL ASSESSMENT METHOD USED:</b>	<p>US Army Corps of Engineers Highway Methodology</p> <p>Functions and values worksheets are included elsewhere in the application.</p>
<b>NAME OF CERTIFIED WETLAND SCIENTIST (FOR NON-TIDAL PROJECTS) OR QUALIFIED COASTAL PROFESSIONAL (FOR TIDAL PROJECTS) WHO COMPLETED THE ASSESSMENT:</b>	REBECCA MARTIN, NHDOT BUREAU OF ENVIORNMENT
<b>DATE OF ASSESSMENT:</b>	FIELD 6/24/21 SHEET 7/26
Check this box to confirm that the application includes a NARRATIVE ON FUNCTIONAL ASSESSMENT:	<input checked="" type="checkbox"/>
For minor or major projects requiring a standard permit without mitigation, the applicant shall submit a wetland evaluation report that includes completed checklists and information demonstrating the RELATIVE FUNCTIONS AND VALUES OF EACH WETLAND EVALUATED. Check this box to confirm that the application includes this information, if applicable:	<input checked="" type="checkbox"/>
<p>Note: The Wetlands Functional Assessment worksheet can be used to compile the information needed to meet functional assessment requirements.</p>	

**CULVERT REHABILITATION  
NH ROUTE 114 OVER BOWMAN BROOK  
BEDFORD, NH  
NHDOT PROJECT NO. 43138  
SUPPLEMENTAL NARRATIVE**

**Project Description**

The project will rehabilitate an existing 72" diameter x 119' long corrugated metal culvert carrying Bowman Brook under NH 114 located approximately 475' north of New Boston Road. The proposed design is to slipline the full length of the existing culvert with a cured in place liner. Incidental work will include minor repairs to the mortared stone headwalls at the inlet and outlet, and filling of sinkholes behind the headwalls.

This is a federally funded culvert rehabilitation project. The proposed Advertising Date is March 8, 2022, with construction anticipated in the summer of 2022.

This project was initiated and is funded under NHDOT's Federal Culvert Replacement/Rehabilitation & Drainage Repair (CRDR) Program. The Program purpose is to address major culvert and drainage needs statewide that are not being addressed through current or future Capital Improvement or other programmatic projects. The Program receives \$2,000,000 in total funding annually, which includes construction, engineering, and ROW costs. Projects are selected and scheduled based primarily on the condition of the culvert (risk of failure), Road Tier, traffic volume, depth of fill, and detour length (potential impact of failure). The Program funding is fully committed for at least the next three years. This culvert is one of the highest statewide priority locations out of nearly 50 known locations eligible for the Program. Failure to address the structural deficiency of this culvert risks deformation of the culvert which would make rehabilitation impossible and/or lead to collapse of the culvert which could cause serious impacts to public/private infrastructure and the travelling public.

**Existing Conditions**

The crossing is a 72" diameter x 119' long. corrugated metal pipe originally constructed in 1965. (see Exhibit 1, Archive Plan, included with this supplemental narrative). Slope is about 0.8% and both ends have mortared stone headwalls. Embankment fill height is about 21'.

The crossing is a Tier 3 based on drainage area. Streamstats reports drainage area at 3.16 sq mi (2,022 acres). The DES permit planning tool returned an area of 3.1555 sq mi. (2019.5 ac). Review of LIDAR contours found some non-contributing area within the Streamstats boundary, resulting in a deduction of 36 acres and a revised watershed area of 1,986 acres or 3.1 sq mi.

NH Route 114 is classified as a Tier 2 roadway (Principal Arterial), with average daily traffic volume in 2019 of 17,816 vehicles per day.

The culvert is in poor condition with heavy rust and perforations along the invert. Sections of missing invert near the inlet are causing sinkholes behind the inlet headwall. The inlet and outlet headwalls need minor repairs.

The roadway on the inlet side is supported by a retaining wall about 10' high x 200' long. This wall was constructed in 2012, along with roadway widening and intersection improvements associated with the Market Basket development. No changes to the culvert were made. The retaining wall was constructed on top of the 72" culvert.

The inlet area is a large ponded wetland with significant storage. Recent field reviews found a significant accumulation of woody debris at the inlet, possibly an old beaver dam or just an accumulation of floating debris. Height was a little over 2' above the invert. The upstream ponded area extends about 700' upstream on a 2015 aerial photo, 300' upstream on the latest google aerial photo (7/2019) and about 400' on the USGS topo map. The upstream channel and floodplain are very flat and wide for about 4,000' upstream. Available storage upstream is estimated at 190 ac-ft using LIDAR contours and maximum elevation of 250.0, which is the FEMA Q100 map elevation.

There is also a ponded area at the outlet, about 30' wide at the widest point and about 75' long. Depth near the culvert outlet is about 3'. At 75' downstream, there is a constriction and the channel changes. The outlet pool and channel constriction are shown on the attached archive plan (Exhibit 1). There is a deposit of small rocks/cobbles just downstream of the constriction on approach to the next structure which is an old 8' wide stone and concrete box culvert at about 100' downstream. The road above this structure is abandoned and mostly removed. The next crossing downstream is a 72" concrete pipe under New Boston Rd, at 550' downstream of the 72" cmp outlet.

NHDOT District 5 Maintenance reports no history of flooding related to the 72" culvert. Multiple field reviews by NHDOT found no perch at the inlet or outlet of the 72" culvert.

Bowman Brook was reviewed by NHDOT Bureau of Environment on 6/4/2021. Bankfull widths were measured at 4 points downstream of the 72" cmp, with an average bankfull width of 18'. A full stream assessment was completed by Normandeau Associates in the same area in 2013 for another downstream culvert rehabilitation (Bedford 16156), finding the stream to be a Rosgen Type E. A bankfull width of 18' and 2.0 entrenchment ratio was used to set the compliant span of 36'. Stream assessment information is attached elsewhere in this application.

## **Natural and Cultural Resources**

### Threatened and Endangered Species:

There are 2 Federal or State listed endangered or threatened species in the project area: the Northern Long Eared Bat, and the Small-Whorled Pogonia (SWP). The project qualifies for the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat. The project has a may affect - likely to adversely affect determination for NLEB due to tree clearing and no further consultation is anticipated. USFWS has concurred that the project area does not appear to contain Small Whorled Pogonia habitat.

The Natural Heritage Bureau data check: It was determined that, although there was an NHB record (e.g., rare wildlife, plant, and/or natural community) present in the vicinity, we do not expect that it will be impacted by the proposed project.

### Essential Fish Habitat:

Bowman Brook is considered Essential Fish Habitat for Atlantic salmon. Coordination has been completed with NOAA GARFO and no conservation measures were recommended.

NH Fish & Game Coordination: 2009 P/A data for Bowman Brook downstream of the project area (Lat 42.95544 Long: -71.48983) found Blacknose dace, Creek chub, Common shiner, Common white sucker,

Eastern brook trout, and Slimy sculpin. Coordination with NH Fish and Game indicated that Brook Trout are not likely to be present and no time of year restriction was recommended for this project.

Cultural Resources: The proposed work was reviewed by the Department's Cultural Resources Program and was found to be consistent with the Section 106 Programmatic Agreement (Section 196 PA) among the FHWA, the New Hampshire State Historic Preservation Office, the Advisory Council on Historic Preservation and the Department. The existing 90" culvert is eligible for review under the Program Comment for Post-1945 Bridges and Culverts and is therefore considered to be non-historic. As such, the proposed work has been determined to have no potential to effect historical resources under Appendix B of the Section 106 PA.

Wetlands:

In addition to Bowman Brook (R2UB12) at the outlet of the structure, the inlet was delineated as a palustrine wetland (PU3Hh/EM1Fb).

Included with this application are a Function and Value Assessments, following the US Army Corp of Engineers' Highway Methodology, for the palustrine wetland delineated within the project limits at the culvert inlet.

Per Env-Wt 103.66 and as defined by Env-Wt 103.10 and 102.01, the project temporarily impacts floodplain wetlands contiguous to a Tier 3 watercourse, a Priority Resource Area (PRA). Further details about this designation can be found within Attachment A: Minor and Major Projects, section I.VI.

Water Quality:

The level of disturbance meets the Bureau of Alteration of terrain (AOT) threshold of greater than 2,500 SF disturbance within 50' of a surface water, however, the project is consistent with the AOT Permit-by-Rule. The project does not propose to increase the amount of impervious surface. It is anticipated that the project will not result in a negative impact on water quality in the project area and therefore, no permanent stormwater treatment is proposed. A NPDES Discharge General Permit may be required if dewatering within the stream is required. Best Management practices will be utilized to prevent and reduce the likelihood of erosion or sediment entering the wetlands system. See the included erosion control plans for more details regarding BMPs.

Impaired Waters:

Bowman Brook is not in the list of impaired waters in Bedford (2018-303d list). The nearest impaired water, the Merrimack River, is more than 2 miles downstream from the project area.

Contamination:

No point source or PFAS concerns were identified in or near the project area.

Prime Wetlands, Designated Rivers, and Shoreland Water Quality Protection Act:

There are no prime wetlands in the vicinity of the project area and the project is not located within the protected corridor of any designated rivers. The project is not located near any waterbodies protected by the NH Shoreland Water Quality Protection Act.

Floodplains:

Bowman Brook is within a FEMA mapped floodplain (Zone AE) with Floodway. The digital FIRM map (Map# 33011C0357D) was downloaded, referenced to the project location, and floodplain and floodway lines were traced onto the Plans. The current effective FEMA flood study (FIS# 33011CV001A, Sept. 2009) was used for verification and calibration of hydrologic and hydraulic models used for analysis.

Invasive Species: Extensive population of Type I and Type II invasive species are present within the project area including: Purple Loosestrife, Japanese knotweed, Oriental bittersweet, multiflora rose, honey suckle and buckthorn. The Contractor will be required to perform all work activities in accordance with the Department publication “Best Management Practices for the Control of Invasive and Noxious Plant Species” in order to prevent the spread of invasive species to the site during construction.

Wildlife Action Plan: Indicates supporting landscape at the inlet and not far from the outlet. There is no highest or highly ranked habitat in the project area. The project area is not within the Connect the Coast project area.

Conservation Lands: No conservation lands were identified in the project impact area.

NHDES Aquatic Restoration Mapper: The 72” cmp crossing type was listed as “Wetland”, with no geomorphic score. AOP Compatibility was listed as “Reduced Passage”. There were no flood hazard flags associated with the crossing.

Conservation Commission: The Town of Bedford Conservation Commission was contacted via letter on May 12, 2021 requesting information about the project area and feedback on the proposed work. There has been no response from the Conservation Commission to date.

## **Hydrology / Hydraulics**

Streamstats found a drainage area of 3.16 Sq mi (2,022 acres) and predicts Q100 at 495 cfs, with a confidence range of 265 cfs to 923 cfs. The same drainage area was listed in the Permit Planning Tool and AQ Restoration Mapper. Review of the drainage boundary found about 36 acres in the vicinity of the 72” cmp outlet not contributing, making the final area 1,986 acres or 3.1 sq miles. See the Watershed Boundary Exhibit included elsewhere in this application.

The SCS Method (Hydrocadd) was used for analysis, using the Cornell 24 hr rainfall predictions. The initial Hydrocadd model was from the drainage report for the Market Basket Development, completed by TF Moran in 2011. The Market basket development did not alter the 72” cmp, but the report included pre and post analysis of the 72” culvert. (with a 2,028 ac drainage area vs Streamstats at 2,022 sc).

The model was modified to reflect the small reduction in drainage area previously noted, updated storage based on LIDAR, and re-calibrated to match the FEMA Q100 regulatory elevation of 249.7 (from Volume 1, Table 8 of the FEMA Study, at Cross Sections O and P for the floodplain area upstream of the 72” cmp). Note that the FEMA Map elevation is rounded to EL 250.

FHWA’s HY-8 Culvert Analysis Program was used to generate rating curves for existing and proposed culvert hydraulics, which were input into the Hydrocadd model.

The current re-calibrated model shows a Q100 inflow of 1,213 cfs. The FEMA study does not provide a flowrate at the 72” cmp crossing.

Note that the FEMA Study, LIDAR, and NHDOT Survey from January 2021 are all referenced to the NAVD88 vertical datum. No elevation adjustments were necessary.

The existing 72” culvert can pass the 100 year storm without bypass. The existing culvert flow at the FEMA EL 249.7 is about 427 cfs. Upstream storage for the 100 year event is about 177 ac-ft. Outlet velocities vary from 4.3 ft/s for a low flow of 10 cfs to 15.1 ft/s for the 100 year storm.

If bypass were to occur, it would begin at EL 253.0 and flow south east between the edge of NH 114 and the Market Basket property.

NHDES Dam Definition check:

The culvert invert is set at the natural streambed elevation, it has adequate discharge capacity, and it does not impound water under normal circumstances. The difference in water surface elevation between the inlet and outlet for the 25 year storm is less than 6', so the crossing is not considered a Dam.

Alternatives

Several rehabilitation alternatives were considered, as well as replacement with a hydraulically sized structure, and replacement with a rules compliant structure.

A fully compliant crossing would be a 36' span bridge, with construction cost estimated at just over \$3.6 million (\$3,626,350) and 1.5 construction seasons duration. Significant temporary widenings and associated wetland and utility impacts would be required on both sides of NH 114 in order to maintain two-way traffic. A sheet pile cofferdam would be required to support the portion of roadway open to traffic and multiple construction phases would be required. A portion of the retaining wall on the inlet side would likely be replaced with a fill slope. Removal of the downstream box culvert and upsizing the 72" rcp under New Boston Rd would be required, but are not included in the cost estimate for this alternative at this stage. The downstream stone box culvert has not been evaluated for historic significance.

Loss of flood storage would have a significant impact on downstream structures and the Bowman Brook channel. For the 100 year storm, flow transferred downstream would increase from 427 cfs to just over 1,200 cfs.

Replacement with a hydraulically sized culvert would be a 12' span x 8' high (clear opening embedded box culvert. This structure is sized to pass Q50 without submerging the inlet. For Q100, storage would be reduced from 177 ac-ft to about 43 ac-ft and flow transferred downstream would increase from 427 cfs to nearly 1,100 cfs. Removal of the downstream box culvert and upsizing the 72" rcp under New Boston Rd would likely be required. Construction cost for this option is estimated at \$2.0 million with impacts similar to the bridge option. Removal of the downstream box culvert and upsizing the 72" rcp under New Boston Rd are not included in the cost estimate for this alternative.

Note that the estimates provided for replacement options are only for construction cost. Design engineering, permit fees, mitigation cost (if any), ROW impacts, and reimbursable utility impacts are not included.

Securing the funding and typical design time for replacement options would require a delay in the start of construction of at least 3 – 5 years. A delay of this magnitude would significantly increase the risk of deformation of the existing pipe and potential sinkholes developing in the deep embankment fill and / or under the retaining wall supporting the roadway on the inlet side.

Rehabilitation alternatives considered included a cured in place liner, a 66" polymer coated corrugated metal pipe liner, and shotcrete invert repair.

The proposed rehabilitation is intended to accomplish a timely structural repair while balancing effects on capacity, velocity, and other resources.

Comparison of model results for the rehabilitation options:

	Q100 Headwater Elevation*	Max ** Capacity	Q100 Outlet Vel.	Base Flow 10 cfs Outlet Vel.	Low Flow 50 cfs Outlet Vel.
Existing 72" cmp	249.7	491 cfs	15.1 ft/s	4.27 ft/s	6.61 ft/s
Cured in Place	249.5	537 cfs	16.88	4.97	7.98
66" Polymer Coated CMP Liner	250.01	429 cfs	16.21	4.33	6.74
Shotcrete invert Repair	249.86	461 cfs	16.3	5.23	8.31

\* FEMA regulatory El is 249.7 FEMA Map El is rounded to 250

\*\* Max capacity is at bypass elevation 253.0

All of the alternatives are within the rounding range of the FEMA Q100 El. (no significant impact), and all of the alternatives cause some increase in velocities over a range of flows.

Shotcrete invert repair is the least desirable from a structural perspective as it only treats the lower portion of the pipe (typically less than half of the diameter). The existing 72" cmp has some small perforations at or above half of the diameter and the pipe was fully bituminous coated on the inside which makes assessment of the metal in the upper sides and top difficult. Rehabilitation that treats the full circumference of the pipe is preferred.

The metal pipe liner has the least capacity and would cause the most change in the pipe invert elevations (in the range of 2" to 3"). Permanent impacts would be required to match the existing streambed to the higher liner inverts.

The cured in place liner is the only option that increases the capacity of the crossing and the wall thickness of the liner will be less than 1". Based on previous project designs, the estimated liner thickness is 15 millimeters, which would result in a raise in inverts of 0.05'. No change to the upstream or downstream channel would be proposed for this option.

The preferred alternative and proposed design is rehabilitation with a Cured in Place Liner

### **Proposed Design**

The proposed design will slipline the full length of the existing culvert, make minor repairs to the stone inlet and outlet headwalls, and fill any sinkholes.

The cured in place liner is a flexible tube impregnated with resin that is inserted into the culvert and inflated with air pressure so that it conforms tightly to the inside of the existing pipe. The resin is cured with steam or UV light, depending on which product is selected. The cured liner will retain some corrugated texture.

The liner thickness is designed by the manufacturer to meet the specific load requirements of the crossing, without any structural support from the existing pipe. Based on previous projects with similar load conditions, the liner thickness for this culvert is expected to be about 15 millimeters (0.05').

Total project duration is expected to be 2 to 3 months, with the majority of the time being for mobilization, access roads, erosion controls, water diversion, and restoration. The current construction cost estimate for the proposed design is \$376,640.

The proposed rehabilitation will not have a significant effect on capacity or velocity. There will be no significant effect on the frequency of flooding, or sediment transport. There will be no effect on FEMA map elevations or downstream structures. There will be no permanent effect to the floodplain wetlands adjacent to Bowman Brook. All work will be within the existing ROW.

The project will be under the 1 acre threshold for earth disturbance for CGP coverage. Total disturbed area is estimated at 22,275 SF (0.51 acres). No disturbance to existing paved areas is proposed. No Permanent wetland impacts are proposed.

Limits of wetland temporary impacts were set at 30' upstream and 40' downstream of the existing culvert ends to allow for erosion controls and water diversion at the inlet and erosion controls and turbidity controls (if necessary) at the outlet.

At the 9/15/21 Natural Resources Meeting, Peter Steckler of the Nature Conservancy suggested the addition of stepping stones along the inlet and outlet headwalls to improve terrestrial wildlife passage from the banks of the upstream and downstream ponded areas to the 72" culvert. Such an improvement would require permanent impacts to the downstream channel and upstream floodplain wetlands which are a Priority Resource. Improving terrestrial passage from the banks to the culvert would be of limited benefit since the culvert is ponded and flowing for most or all of the year in normal conditions. This improvement is not included in the proposed work so that the uncertainties in permitting and mitigating impacts to a PRA does not complicate or delay permitting of the proposed rehabilitation work.

### **Construction and access considerations**

Temporary access roads will be required for access to the culvert inlet and outlet. See the Wetland Plans and Erosion Control Plans for proposed access road locations. At inlet and outlet, access will begin from the edge of NH 114 at the ends of the existing guardrail where there are maintained grass areas. The majority of the proposed access roads do not impact jurisdictional areas.

Access to the culvert inlet from the northeast was considered but was determined to require more clearing and more temporary wetland impacts than the proposed access from the southeast. Access to the culvert outlet from the southwest was considered but was determined to require more clearing and more temporary wetland impacts than the proposed access from the northwest. Access from the edge of NH 114 directly above the culvert ends was considered but determined to be not practical due to the guardrail and retaining wall on the inlet side and guardrail, steep slope immediately behind the guardrail, and potential traffic impacts associated accessing a temporary opening in the guardrail at the outlet side.

Access road impacts in wetland areas are intended to be temporary. Trees may be cut but stumps and root mat will not be removed in wetland areas so that vegetation can re-establish naturally. Any disturbed jurisdictional areas will be stabilized using wetland seed mix, mulch, and wildlife friendly temporary erosion control matting (where slopes are steeper than 4:1).

Temporary access roads will be constructed in such a way that will protect the wetland vegetation beneath by implementing a barrier such as timber mats, or a stone or aggregate base over geotextile that will also address any concentrated flows along or beneath the constructed access road and minimize impacts to water quality. If stone over geotextile is used, concentrated runoff along the edge of the access roads can be managed by creating a temporary ditch along the road and using typical erosion control bmp's to minimize

impacts to water quality such as stone check dams and or other temporary channel protection measures. If mats are used, runoff can pass below or along the mats.

Some clearing will be required, but no grubbing / stump removal is proposed. Maximum anticipated clearing at inlet is about 635 SF. Maximum anticipated clearing at outlet is about 4,878 SF. Total clearing is estimated at 5,513 SF.

The clearing areas and temporary impact areas are intended to be a reasonable estimate of the space required to accomplish the work, allowing for variations in the Contractor's method of access and type of equipment that could be used, such as excavators and cranes. The Contractor's proposed clearing, access, and staging areas will be subject to review and approval by the NHDOT Engineer. The Contract will have a provision requiring the Contractor to avoid or minimize clearing to the maximum extent practical and the clearing areas will be subject to review and approval by the NHDOT Engineer. Clearing will also be subsidiary to the work, meaning the Contract will not have a direct pay Item for this work, which provides an incentive for the Contractor to minimize this type of work.

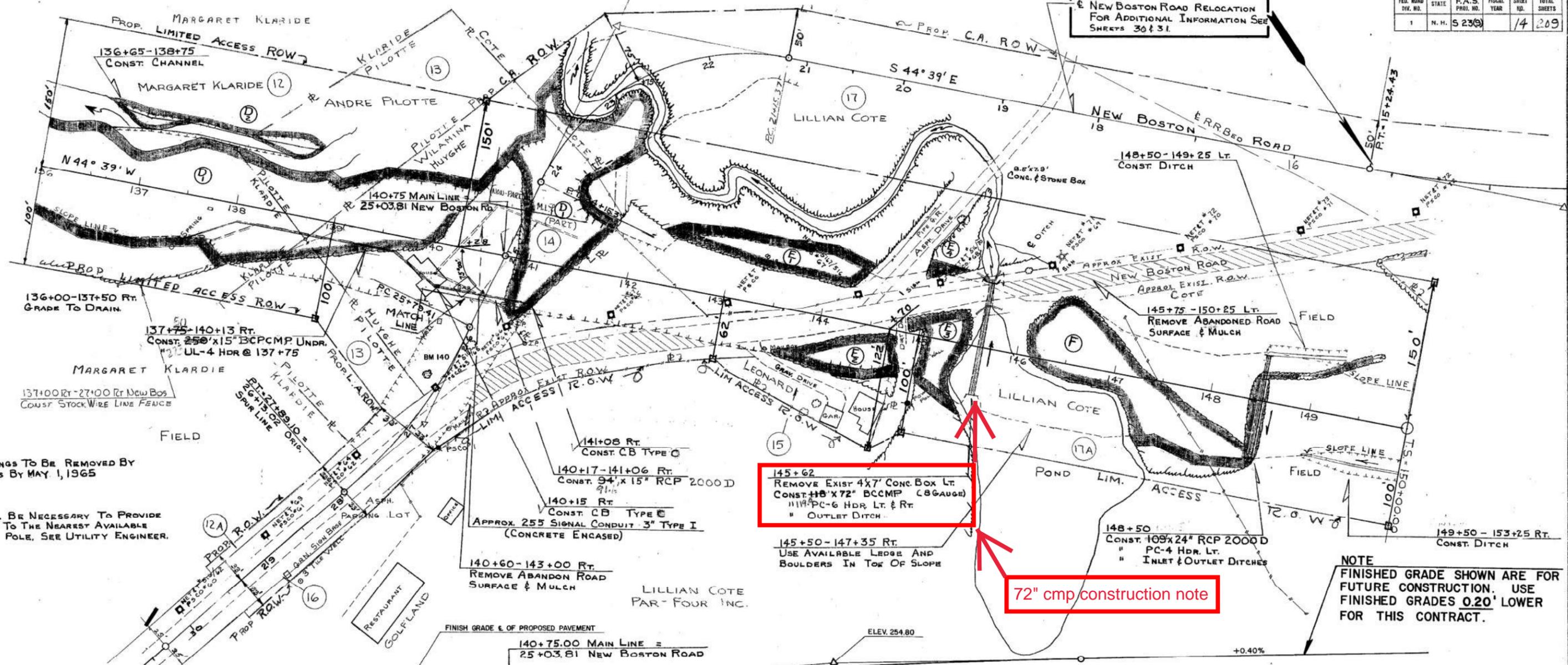
Stream flow can be allowed to flow through or be pumped through the existing pipe for most of the project duration and during storm events. At a minimum, the Contractor's water diversion plan must be designed to accommodate the 2-year storm. The Contractor's water diversion plan will also need to allow for the pipe to be dry for at least one day during insertion and curing of the liner. The existing 72" pipe would still be available to accommodate an unanticipated 2-year event, although insertion of the liner should be scheduled for a forecasted dry period. One option for a short duration water diversion around the existing pipe is to route a pump hose through the existing 24" rcp located just north of the 72" cmp and back to the 72" cmp outlet. Setting the pump and routing the hose would not require ground disturbance or any additional clearing of trees over 3" dbh. The Contractor's water diversion plan will address specific means and methods for managing water.

### **Summary**

This application requests approval for the proposed rehabilitation under Env-Wt 904.09 which includes Repair of Existing Legal Tier 3 Crossings, under part (b) which includes cured in place lining.

The specific requirements of Env-Wt 904.09 are listed and discussed elsewhere in the application.

NEW BOSTON ROAD RELOCATION FOR ADDITIONAL INFORMATION SEE SHEETS 30 & 31.

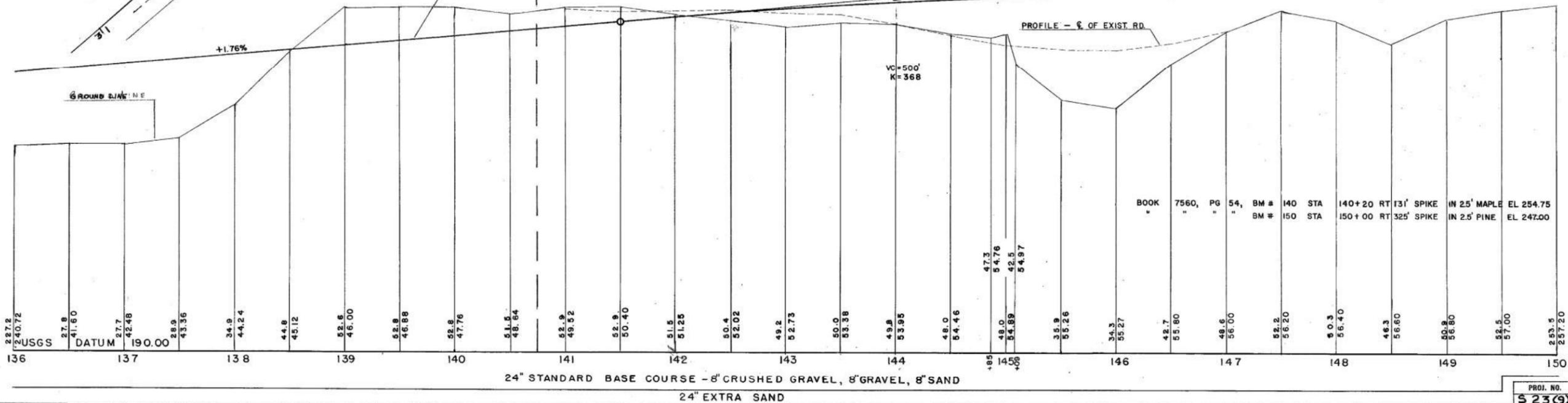


NOTE: BUILDINGS TO BE REMOVED BY OTHERS BY MAY 1, 1965

NOTE: IT WILL BE NECESSARY TO PROVIDE CONDUIT TO THE NEAREST AVAILABLE SERVICE POLE, SEE UTILITY ENGINEER.

NOTE FINISHED GRADE SHOWN ARE FOR FUTURE CONSTRUCTION. USE FINISHED GRADES 0.20' LOWER FOR THIS CONTRACT.

72" cmp construction note



CHECKED BY: K.B. BARWOOD 2/11/64  
 PROFILE TRACED BY: L. MOULTON 2/19/64  
 CHECKED BY: R.B. BARWOOD 3/17/64  
 INKED BY: C.L. MOULTON 3/14/64  
 CHECKED BY: R.B. BARWOOD 3/14/64  
 P/W Checked by J. Yonckis 4/12/73  
 12-22-65 BOUNDS PLOTTED BY BRUNER



# AVOIDANCE AND MINIMIZATION CHECKLIST

## Water Division/Land Resources Management Wetlands Bureau



[Check the Status of your Application](#)

**RSA/Rule:** RSA 482-A/ Env-Wt 311.07(c)

This checklist can be used in lieu of the written narrative required by Env-Wt 311.07(a) to demonstrate compliance with requirements for Avoidance and Minimization (A/M), pursuant to RSA 482-A:1 and Env-Wt 311.07(c).

For the construction or modification of non-tidal shoreline structures over areas of surface waters without wetland vegetation, complete only Sections 1, 2, and 4 (or the applicable sections in [Attachment A: Minor and Major Projects \(NHDES-W-06-013\)](#)).

The following definitions and abbreviations apply to this worksheet:

- “A/M BMPs” stands for [Wetlands Best Management Practice Techniques for Avoidance and Minimization](#) dated 2019, published by the New England Interstate Water Pollution Control Commission (Env-Wt 102.18).
- “Practicable” means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes (Env-Wt 103.62).

SECTION 1 - CONTACT/LOCATION INFORMATION		
APPLICANT LAST NAME, FIRST NAME, M.I.: NH Dept. of Transportation		
PROJECT STREET ADDRESS: NH 114, 475' north of New Boston Road.	PROJECT TOWN: Bedford	
TAX MAP/LOT NUMBER: N/A NHDOT ROW		
SECTION 2 - PRIMARY PURPOSE OF THE PROJECT		
Env-Wt 311.07(b)(1)	Indicate whether the primary purpose of the project is to construct a water-access structure or requires access through wetlands to reach a buildable lot or the buildable portion thereof.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p>If you answered “no” to this question, describe the purpose of the “non-access” project type you have proposed:</p> <p>The purpose of this project is to rehabilitate an ageing 72" diameter x 119' long corrugated metal culvert, a valuable state asset, in order to support long term and safe use of the State's public transportation network.</p>		

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<b>SECTION 3 - A/M PROJECT DESIGN TECHNIQUES</b>		
Check the appropriate boxes below in order to demonstrate that these items have been considered in the planning of the project. Use N/A (not applicable) for each technique that is not applicable to your project.		
Env-Wt 311.07(b)(2)	For any project that proposes new permanent impacts of more than one acre or that proposes new permanent impacts to a Priority Resource Area (PRA), or both, whether any other properties reasonably available to the applicant, whether already owned or controlled by the applicant or not, could be used to achieve the project's purpose without altering the functions and values of any jurisdictional area, in particular wetlands, streams, and PRAs.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 311.07(b)(3)	Whether alternative designs or techniques, such as different layouts, construction sequencing, or alternative technologies could be used to avoid impacts to jurisdictional areas or their functions and values.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 311.07(b)(4) Env-Wt 311.10(c)(1) Env-Wt 311.10(c)(2)	The results of the functional assessment required by Env-Wt 311.03(b)(10) were used to select the location and design for the proposed project that has the least impact to wetland functions.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 311.07(b)(4) Env-Wt 311.10(c)(3)	Where impacts to wetland functions are unavoidable, the proposed impacts are limited to the wetlands with the least valuable functions on the site while avoiding and minimizing impacts to the wetlands with the highest and most valuable functions.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 313.01(c)(1) Env-Wt 313.01(c)(2) Env-Wt 313.03(b)(1)	No practicable alternative would reduce adverse impact on the area and environments under the department's jurisdiction and the project will not cause random or unnecessary destruction of wetlands.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 313.01(c)(3)	The project would not cause or contribute to the significant degradation of waters of the state or the loss of any PRAs.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 313.03(b)(3) Env-Wt 904.07(c)(8)	The project maintains hydrologic connectivity between adjacent wetlands or stream systems.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 311.10 A/M BMPs	Buildings and/or access are positioned away from high function wetlands or surface waters to avoid impact.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 311.10 A/M BMPs	The project clusters structures to avoid wetland impacts.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 311.10 A/M BMPs	The placement of roads and utility corridors avoids wetlands and their associated streams.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
A/M BMPs	The width of access roads or driveways is reduced to avoid and minimize impacts. Pullouts are incorporated in the design as needed.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
A/M BMPs	The project proposes bridges or spans instead of roads/driveways/trails with culverts.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A

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A/M BMPs	The project is designed to minimize the number and size of crossings, and crossings cross wetlands and/or streams at the narrowest point.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 500 Env-Wt 600 Env-Wt 900	Wetland and stream crossings include features that accommodate aquatic organism and wildlife passage.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 900	Stream crossings are sized to address hydraulic capacity and geomorphic compatibility.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
A/M BMPs	Disturbed areas are used for crossings wherever practicable, including existing roadways, paths, or trails upgraded with new culverts or bridges.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
<b>SECTION 4 - NON-TIDAL SHORELINE STRUCTURES</b>		
Env-Wt 313.03(c)(1)	The non-tidal shoreline structure has been designed to use the minimum construction surface area over surfaces waters necessary to meet the stated purpose of the structure.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(2)	The type of construction proposed for the non-tidal shoreline structure is the least intrusive upon the public trust that will ensure safe navigation and docking on the frontage.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(3)	The non-tidal shoreline structure has been designed to avoid and minimize impacts on the ability of abutting owners to use and enjoy their properties.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(4)	The non-tidal shoreline structure has been designed to avoid and minimize impacts to the public's right to navigation, passage, and use of the resource for commerce and recreation.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(5)	The non-tidal shoreline structure has been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(6)	The non-tidal shoreline structure has been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A



**PUBLIC HIGHWAYS  
PROJECT-SPECIFIC WORKSHEET  
FOR STANDARD APPLICATION**  
Water Division/Land Resources Management  
Wetlands Bureau  
[Check the Status of your Application](#)



**RSA/Rule:** RSA 482-A/ Env-Wt 522

**APPLICANT LAST NAME, FIRST NAME, M.I.:** NH Dept. of Transportation

This worksheet summarizes the criteria and requirements for a Standard Permit for “Public Highways”, one of the 18 specific project types in Chapter Env-Wt 500. In addition to the project-specific criteria and requirements on this worksheet, all Standard Dredge and Fill Applications must meet the criteria and requirements listed in the Standard Dredge and Fill Application form (NHDES-W-06-012).

**SECTION 1 - APPLICABILITY AND EXEMPTION (Env-Wt 527.01; Env-Wt 527.06(b))**

This worksheet is for construction and maintenance projects for public highways in jurisdictional areas, but not for:

- Activities relating to stream crossings (which must be undertaken in accordance with Env-Wt 900);
- Public highway projects that impact tidal resources (which must be undertaken in accordance with Env-Wt 600); or
- Bank stabilization projects (which must be undertaken in accordance with Env-Wt 514).

Replacement of dislodged rocks on an existing rip-rap portion of a legally existing permitted road embankment to stabilize the structure may be done without a permit.

**SECTION 2 - APPROVAL CRITERIA FOR PUBLIC HIGHWAY PROJECTS (Env-Wt 527.02)**

An application for public highway project must meet the following approval criteria, subject to the rebuttable presumption in RSA 482-A:3, I-a that for applications proposed, sponsored, or administered by the New Hampshire Department of Transportation (NHDOT), NHDOT has exercised appropriate engineering judgment in the project’s design:

- The project meets the design criteria specified in Env-Wt 527.04;
- The project is consistent with RSA 482-A:1, RSA 483, RSA 483-B, RSA 485-A, and RSA 212-A;
- The purpose of the project is to improve or maintain public safety, consistent with federal and state safety standards;
- The project will not cause displacement of flood storage wetlands or cause diversion of stream flow impacting abutting landowner property; and
- For a project in the 100-year floodplain, the project will not increase flood stages off-site.

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**SECTION 3 - APPLICATION REQUIREMENTS FOR PUBLIC HIGHWAY PROJECTS (Env-Wt 527.03)**

Please provide the following information:

- A description of the scope of the project, the size of the impacts to aquatic resources, and the purpose of the project;
- The purpose of the project is to rehabilitate an existing 72" corrugated metal culvert carrying Bowman Brook under NH Route 114. The proposed rehabilitation will slipline the full length of the existing culvert (119 LF) with a cured in place liner. Incidental work is limited to repairing the existing mortared stone headwalls at the inlet and outlet and filling sinkholes behind the headwalls.
- No permanent impacts are proposed. Total temporary impacts proposed are 3,194 SF.
- An accurate drawing with existing and proposed structure dimensions clearly annotated to:
- Document existing site conditions;
  - Detail the precise location of the project and show the impact of the proposed activity on jurisdictional areas;
  - Show existing and proposed contours at 2-foot intervals;
  - Show existing and proposed structure invert elevations on the plans; and
  - Use a scale based on standard measures of whole units, such as an engineering rule of one to 10, provided that if plans are not printed at full scale, a secondary scale shall be noted on the plans that identifies the half scale unit of measurement;
- All easements and right-of-way acquisition area outlines in relation to the project;
- The name of the professional engineer who developed the plans, whether an employee of the applicant or at a consulting firm; and
- An erosion control plan that shows:
- Existing and proposed contours at 2-foot intervals, with existing contours shown with a lighter line weight and proposed contours shown with a heavier line weight such as a bold font; and
  - The outermost limit of all work areas, including temporary phasing work, with perimeter controls.

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**SECTION 4 - DESIGN REQUIREMENTS FOR PUBLIC HIGHWAY PROJECTS (Env-Wt 527.04)**

In addition to meeting all applicable criteria established in Env-Wt 300, all projects must:

- Protect significant function wetlands, watercourses, and priority resource area(s);
- Minimize impacts to wetland and riparian function;
- Maintain wetland and stream hydrology and function to the remaining aquatic resources;
- Use on-site measures to compensate for any loss of flood storage where the project proposes:
  - Filling or placement of structures in a 100-year floodplain; or
  - Greater than 0.5 acre-feet of fill volume or a road crossing that affects floodplain conveyance;
- Use on-site minimization and water quality protection measures to prevent direct discharge to surface waters and wetlands, including retention of vegetated filter strips between the construction area and the aquatic resource areas to disperse runoff with no direct discharge to natural wetlands or surface waters; and
- Where temporary impacts will occur, include re-establishment of a similar ecosystem using vegetative species and spacing that are as similar as practicable to what was removed unless the applicant shows that the proposed vegetative composition will provide higher functions and values.

**SECTION 5 - CONSTRUCTION REQUIREMENTS FOR PUBLIC HIGHWAY PROJECTS (Env-Wt 527.05)**

In addition to complying with all applicable conditions in Env-Wt 307, the following construction requirements apply to public highway projects:

- The permit shall be contingent on review and approval by NHDES of final stream diversion and erosion control plans that detail the timing and method of stream flow diversion during construction and show temporary siltation, erosion, and turbidity control measures to be implemented; and
- The contractor responsible for completion of the work shall use techniques described in Env-Wq 1504.06, Env-Wq 1504.16, Env-Wq 1505.02, Env-Wq 1506, and Env-Wq 1508.

**SECTION 6 - PUBLIC HIGHWAY PROJECTS PROJECT CLASSIFICATION (Env-Wt 527.07)**

Public highway projects shall be classified based on the dimensions established in Env-Wt 407, subject to the adjustments and project exceptions established in Env-Wt 407.

# BUREAU OF ENVIRONMENT CONFERENCE REPORT

**SUBJECT:** NHDOT Monthly Natural Resource Agency Coordination Meeting

**DATE OF CONFERENCE:** September 15, 2021

**LOCATION OF CONFERENCE:** Virtual meeting held via Zoom

## ATTENDED BY:

### NHDOT

Andrew O'Sullivan  
Matt Urban  
Rebecca Martin  
Arin Mills  
Ron Crickard  
Mike Dugas  
Wendy Johnson  
Shelly Winters  
Emily Polychronopolous  
Sam Newsom  
Chris Carucci  
Kerry Ryan  
Tim Boodey  
Joseph Jorgens

### ACOE

Absent

### EPA

Jeanie Brochi

### NHDES

Lori Sommer  
Karl Benedict

### NHB

Jessica Bouchard

### NH Fish & Game

Carol Henderson

### Federal Highway

Jaimie Sikora

### The Nature Conservancy

Pete Steckler

### Consultants/ Public Participants

Christine Perron  
Julia Sterns  
Kien Ho  
Tyler DeRuiter  
Jay Doyle  
John Bruneau  
Jen Riordan  
Meg Gordon

## PRESENTATIONS/ PROJECTS REVIEWED THIS MONTH: *(minutes on subsequent pages)*

Finalize Meeting Minutes.....	2
Hampton-Portsmouth, 26485 (X-A003(355)).....	2
Claremont, Washington Street Traffic Signal Project, #CMAQ 41748 (X-A004(736)).....	5
Dover Drainage Repair 40042 (Non-federal).....	7
Bedford #43138 (X-A005(049)).....	8
Nashua-Manchester, #40818 (Capital Corridor Rail) .....	11
Madbury, #43276, (X-0005(068)).....	15

**NOTES ON CONFERENCE:****Finalize Meeting Minutes**

Finalized and approved the August 18, 2021 meeting minutes.

**Hampton-Portsmouth, 26485 (X-A003(355)).**

Christine Perron introduced the project, which involves improvements to a rail trail and is funded under the Federal CMAQ (Congestion Mitigation & Air Quality Improvement) Program. The project consists of approximately 9.8 miles of the Hampton Branch Rail Corridor, recently purchased by NHDOT from Pan Am Railways, beginning at the southern terminus about 1,000 feet north of Drakeside Road in Hampton and continuing north-northeast to the northern terminus at Barberry Lane in Portsmouth. The purpose of today's meeting is to provide a general overview of proposed improvements and existing resources and to start getting preliminary input from the resource agencies on permitting requirements. The project is being designed by Greenman-Pedersen Inc (GPI) and McFarland Johnson Inc (MJ) is completing the environmental review.

The purpose of the project is to improve the condition of the trail to accommodate bicycles and pedestrians. This segment of the rail corridor was purchased by NHDOT for the purpose of create a recreational trail. The intent is for the trail to become part of the NH Seacoast Greenway, a proposed 17-mile trail connecting NH's eight coastal communities. This greenway would then become part of the East Coast Greenway, a 2900-mile effort to connect Calais, Maine to Key West, Florida via a multimodal trail. Improvements to the 9.8-mile corridor that will be addressed under this project are needed because the existing condition of the trail is not conducive to recreational use and parts of the trail have drainage and flooding concerns that need to be addressed. Design of the improvements is just getting underway. A public informational meeting will likely be held this fall.

Tim Whitney provided an overview of the anticipated improvements that will be needed. These improvements are expected to entail the following: removal of any remaining rail ties, resurfacing of the trail, clearing vegetation, drainage upgrades and improvements, including closed drainage system replacement work in Hampton, surface drainage regrading, roadway crossing modifications, trail reconstruction in some locations, bridge rehabilitation, and cross culvert replacements. Additional details were reviewed for the Hampton segment of the trail. This segment has drainage and flooding concerns where an approximately 0.5-mile existing closed drainage system under the railroad bed sees significant flooding during even moderate rain events. The existing system has an 18-inch clay pipe trunkline and improvised manholes and catch basins.

The closed system stretches from the Hannaford detention basin in Hampton and flows southerly to the south of Depot Square in Hampton where it then outlets into existing wetlands to the west. North of the closed drainage are existing ditches that flow south and enter the closed system. Much of the surface drainage from Route 1 and the neighborhoods and businesses between Route 1 and the rail trail outlet to the existing railroad corridor and eventually enter the closed system. For instance, the detention basin that handles all stormwater from the Hannaford store parking lot and roof outlets directly into the closed system under the rail trail. It has been determined that the existing 18-inch pipe is vastly undersized. The proposed concept is to use drainage swales from the Hannaford detention basin southerly to Exeter Road. There the water will enter a new and properly

sized closed drainage system and outlet at the same location and elevation that it does today. A detention basin may be necessary at the outlet to slow the water as it exits the system. An underground chamber system is also being investigated. This area of the corridor has a narrow right-of-way that may be a concern if a detention basin is needed.

C. Perron provided an overview of resources along the corridor. A wetland delineation has been completed in some locations to date, with the intent to delineate only in locations where there is potential for impacts rather than completing the delineation along the entire 9.8-mile corridor. National Wetland Inventory and Priority Resource Area mapping was reviewed to provide a sense of the extent of wetlands that are present. Priority Resource Areas will be field confirmed if located within areas to be delineated. All mapped wetlands along the corridor in Portsmouth are Prime Wetlands with 100-foot buffers. Impacts in Prime Wetlands will require additional coordination and appropriate mitigation.

The project team is still in the process of identifying locations where there is potential for wetland impacts and will be reviewing those locations at a future meeting. It is anticipated that impacts will or could occur where there are drainage upgrades, such as in Hampton, where cross culverts will be replaced, and where the trail surface will be elevated slightly to improve drainage. In general, wetland impacts are not expected along the entire length of the trail.

Three cross culverts will need to be replaced. One culvert is located in Greenland approximately 800 feet south of Breakfast Hill Road. Based on mapped streams, this crossing is located on Berry Brook. However, the delineation did not identify a defined stream channel at the culvert and the culvert is located within an extensive wetland system. Based on watershed size, this is a Tier 2 stream crossing, but input from NHDES is needed to determine if the replacement culvert needs to be designed and permitted as a stream crossing.

The second culvert is in Portsmouth about 0.6 miles north of Banfield Road. This culvert is also located within an extensive wetland system with no defined stream channel. Based on mapped streams, Pickering Brook is shown to cross the rail corridor approximately 200 feet south of the culvert. The mapped location was reviewed during the delineation and no crossing structure was found and there was no evidence of flow from one side of the trail to the other. Again, input from NHDES is needed to determine if the replacement culvert needs to be designed and permitted as a stream crossing. Due to the lack of a defined stream channel at these two culverts, it was not possible to measure bankfull width or other channel characteristics on which to base a crossing design. The Portsmouth culvert also has beaver activity, with evidence of some amateur maintenance work at the culvert to alleviate flooding.

The third culvert is located Portsmouth under Barberry Lane and carries runoff from existing ditches. This site will be field reviewed to confirm the lack of jurisdictional resources.

The NH Natural Heritage Bureau database review resulted in many records of threatened and endangered plant species and exemplary natural communities along the corridor. The locations of these resources will be tracked to determine if there is any potential for impacts. Once that is determined, there will be additional coordination with the Natural Heritage Bureau to discuss potential concerns and the need for surveys.

The entire project is located within the NH Coastal Zone. There will be coordination with the NH Coastal Program to determine the need to prepare a Coastal Zone Management Act consistency review.

The potential to split the corridor into two separate projects was reviewed. When the design team realized that the Hampton drainage issues could slow progress of the overall project, it was suggested that the corridor be split into two separate projects. In coordinating with FHWA, it was agreed that separate projects would have independent utility as long as the corridor was split in a way that allowed access to each segment of the trail. A logical split would be located at a DOT owned property in Hampton that provides good trail access and has been suggested as a potential future trailhead. Splitting the corridor here would create one project for the southern segment, which would be 1.5 miles, and a second project for the northern segment, which would be 8.1 miles. The project overall has a lot of public support and has generated a lot of enthusiasm, and splitting the projects would allow a portion of the trail to be completed as scheduled to maintain that public support. One reason for meeting today is to get input on any potential concerns with splitting the project, which would result in two NEPA documents and more than likely two permitting efforts. If there are two separate permitting efforts, cumulative impacts for the two projects combined could be considered for mitigation purposes.

Karl Benedict provided the following comments:

- Priority Resource Areas should be confirmed in the field, especially those identified as peatlands.
- For floodplain wetlands adjacent to Tier 3 crossings, net flood storage should be considered.
- Be sure to consider buffer impacts at prime wetlands.
- The two wetland culverts should be considered stream crossings and would be permitted as alternative designs; Existing conditions and constraints should be summarized in the alternative design technical report.
- Outfall locations for closed drainage system should seek to avoid wetland impacts.
- The project will require compliance with Alteration of Terrain requirements.
- Invasive plant management should be taken into consideration.
- No concerns with splitting into two projects as long as cumulative impacts are considered for mitigation purposes.
- Changes in water surface elevation should be reviewed with the Natural Heritage Bureau since some of the species and communities may be sensitive to changes in water level.

Lori Sommer had the following comments and questions:

- Agree with Karl's comments.
- Review potential impact locations for vernal pools.
- It would be interesting to have game cameras set up at the stream crossings.
- No concerns with splitting into two projects, especially since it sounds likely that both projects would require mitigation, but you should get input from the Corps (not present at today's meeting).
- The proposed impacts may require a DES public hearing.

- Does NHDOT own the right-of-way and are there additional side trails off the main corridor? C. Perron responded that the NHDOT does own the right-of-way and that she is not aware of any existing or proposed side trails.

Carol Henderson provided the following comments:

- No concerns with splitting into two projects.
- Surprised to see that no wildlife species were listed in the NHB review memo. The memo has expired, so perhaps wildlife species will be added when the memo is updated.
- Curbing is not recommended due to its impact to amphibian and reptile connectivity.
- She will ask the NHFG Marine Division for input on Berry Brook.

Jean Brochi commented:

- Agree with comments made by others.
- Section 106 will need to be addressed. C. Perron responded that the entire corridor is considered eligible for the National Register of Historic Places and there will be Section 106 consultation as proposed work is progressed.
- Has concerns with splitting into two projects but understand if there is a need. If the decision is made to split the corridor into separate projects, the need for this should be documented and cumulative impacts will need to be addressed.

Jamie Sikora noted that splitting the corridor into two projects will require documenting that each segment has independent utility.

Jessica Bouchard commented:

- All of the species known to occur in the vicinity of the project are wetland species.
- Reach out once potential impact locations are identified in order to discuss the need for surveys. Surveys will likely be necessary in areas of wetland impacts.
- Concur with Karl's comment regarding consideration of water surface elevation, especially within Great Bog in Portsmouth.

Pete Steckler commented:

- Be mindful of wildlife connectivity and consult Connect the Coast resources.
- No concerns with splitting into two projects.
- Consider the need for a crosswalk on Route 1 near the proposed split.

### **Claremont, Washington Street Traffic Signal Project, #CMAQ 41748 (X-A004(736))**

BETA provided a presentation of the Claremont, NH – Washington Street Traffic Signal Optimization project and its related impacts to Natural Resources.

**Project Purpose and Need:** Upgrading the equipment and installing communications to improve traffic flow and reduce delays for the ±2-mile corridor.

**Background:** CMAQ funded project where BETA is completing the design.

**Project Locations:** 10 Signalized Intersections from Water Street to Home Depot.

NHDOT has upgraded the Walmart signal last year

**Scope:** Improve the technology of the equipment. Noted that the Walmart intersection was a complete upgrade, whereas this project will be less invasive.

**Repeaters Discussion:** Noted that we may need to install new poles. Goal is to mount them on existing poles.

**Environmental:** Previous submissions with NHB noted no disturbance. Do we need to resubmit if there may be disturbance related to foundations?

**Floodplains:** Zone AE could be affected by intersections 6-10.

**Wetlands:** Delineation has not been conducted, but review of NH GIS shows the Sugar River flows between Intersections 1-2 and comes close to Intersection 4. Noted Perennial Stream between Intersection 3-4-5. Open water body approx. 10' from the road near Intersection 5.

**Recreation Trail** – Sugar River Public Trail is adjacent to the road. Don't expect any impacts to the recreational area.

*If we're adding site locations by installing new poles, does this change the Project and require re-review by National Heritage.*

## QUESTIONS AND COMMENTS

Karl Benedict – NH DES

*If there are new pole locations, the wetland delineation may be necessary to determine areas that should be avoided. Preferred that the impacts are outside of the areas.*

*If it's determined that there are wetlands and a pole is necessary, perform Wetland Permitting.*

*As of now, it doesn't seem likely that we would impact wetlands.*

Lori – NH DES

*No additional comments beyond noted by Karl.*

*If there are wetland or floodplain impacts associated with Tier 3 areas, come back to Resource Agencies to discuss.*

Carol – NH Fish and Game

*If there are wetland impacts, should be revisited and require a new NHB. The Department itself doesn't have its own permit. So, would not require something unless wetland impacted. Could solicit if interested in responses.*

Jean – EPA

*No additional comments.*

Jamie – FHWA

*No response.*

Jessica – NHB  
*No Response.*

Pete – TNC  
*No comments.*

Ron Crickard – NHDOT Bureau of Environment.  
*Because we're changing the scope, we should update the documents, touch base with Jillian Edelman of Cultural Resources with new areas, wetlands and floodplain impacts will need to be addressed in NEPA documents and permitted as required.*

### **Dover Drainage Repair 40042 (Non-federal)**

Arin Mills and Emily Polychronopoulos from NHDOT presented the Dover drainage repair project, a state funded project under the Bureau of Turnpikes. Arin said the statewide project also includes drainage repairs in Merrimack which have no wetlands impacts. The work includes repairs to existing drainage locations and installation of stone lined outlet basins. A map was shown with the National Wetlands Inventory data to show drainage from these pipes leads in to the large wetland complex which further flows into Indian Brook and eventually to the Cochecho River. Original 1979 construction plans were shown, with potential for additional work to the pipes possibly done in 1980's. Photos were shown of the existing conditions pipe inlet/outlet for both #73021 and 73-xxx.

Emily described the project as repairs to existing pipes to address back-up of water on the ramp roadway from a clogged pipe, resulting in safety concerns. Pipe #73021 is clogged, and the project will remove debris and install an intermediate manhole midway to allow for future cleaning and maintenance from outside the wetland. Pipe #73-xxx was located and identified during the field investigation, and the outlet is submerged. Pipe #73021 is approx. 860' long and collects water from the Turnpike closed drainage system. Once debris is removed both pipes will be evaluated for the slip lining and repair as needed. Both pipes propose a stone lined outlet basin with headwalls, while construction of a single access road will allow both pipes to be accessed and maintained.

Wetland impact plans were shown for installation of the outlet basins and access to conduct the work. Permanent wetlands impacts for pipe #73021 are anticipated for basin construction and installation of a portion of the access road that will be used for future maintenance of the structure. Permanent impacts for basin 73-xxx are for basin construction and temporary impacts for access. The existing drainage pipes will remain as they are deep beneath the roadway bed. The outlet basin will allow for sediment to collect and regular maintenance and cleaning can be conducted. Emily provided a basic overview of the construction sequence to include installation of erosion control measures, access road construction, dewater outlet, clean out pipe and construct outlet basin. Once the pipe is constructed it will be determined if the pipe is compromised and if a slip-line is necessary. Once work is complete the disturbed areas will be spread with humus and reseeded, and erosion control measures will be removed once established.

Arin provided an overview of the environmental resources to include no Designated river or FEMA floodplain, no previous permits identified, no conservation lands adjacent and no contamination identified via OneStop or field review. NHB21-1489 determined although species

identified no impacts are anticipated. Arin mentioned another review was recently conducted due to the change in project type classification, and results are pending. Northern long-eared bat was determined consistent with the 4(d) rule, and cultural review is underway. The GIS data determined a potential for peatlands/bog, a potential Priority Resource Area (PRA), and a field review determined the impact areas do not have soils and/or vegetation consistent with a bog and therefore is not considered a PRA. Invasive species, mainly Phragmites, will utilize the DOT invasive species BMP's to control this Type II invasive species.

Karl B. asked if there is potential for relocation of the outlets and Emily stated relocation was not considered due to the depth of the pipe below the roadway and the existing nearly flat slope of the pipe. Karl further asked how the proposed outlet basin would be maintained, once constructed, and at what interval. Emily said maintenance staff would likely check the outlet yearly to assess for needed maintenance. The access road would be constructed and maintained to allow for future maintenance and cleaning of the structure, and equipment could conduct necessary cleaning without requiring equipment in the wetland. Karl further asked restoration and maintenance with regards to invasive species would be managed and asked ensure temporary and permanent impacts be reviewed. Karl further asked for details on access in wetland area as well as restoration of muck containing invasive species; to which it was clarified removal of muck will only occur in the outlet basin permanent impacts. Lastly Karl asked for verification of the resources identified and potential for USGS stream. Arin confirmed no USGS stream is identified in this area.

Lorie S said so long as impacts remain under 10,000 sf so no mitigation is required. Carol H noted the NHB results determined no impacts noted. Genie, Jessica and Pete had no comments.

### **Bedford #43138 (X-A005(049))**

Chris Carucci, NHDOT Highway Design, gave an overview of the proposed federally funded culvert rehabilitation project. The proposed AD date is March 8, 2022, with construction anticipated in the summer of 2022.

The culvert carries Bowman Brook under NH Route 114, approximately 475' north of New Boston Road, and is a Tier 3 crossing. The existing culvert is a 72" diameter x 119' long corrugated metal pipe constructed in 1965. Slope is about 0.8% and both ends have mortared stone headwalls. Embankment fill height is about 21'. The culvert is in poor condition with heavy rust and perforations along the invert. Sections of missing invert near the inlet are causing sinkholes behind the inlet headwall. The inlet and outlet headwalls need minor repairs. There was no perch at the inlet or outlet of the 72" cmp.

The inlet area is a large ponded wetland with significant storage. There is also a ponded area at the outlet, about 30' wide at the widest point and about 75' long. Depth near the culvert outlet is about 3'. At 75' downstream, there is a constriction and the channel changes. The outlet pool and constriction are shown on the original construction plans. The next two structures downstream are an 8' wide stone and concrete box culvert and then a 72" concrete pipe under New Boston Rd.

NHDOT District 5 Maintenance reports no history of flooding related to the 72" cmp culvert. Bowman Brook was reviewed by NHDOT Bureau of Environment on 6/4/2021. Bankfull widths were measured at 4 points downstream of the 72" cmp, with an average bankfull width of 18'. A full stream assessment was completed by Normandeau Associates in the same area in 2013 for

another downstream culvert rehabilitation (Bedford 16156), finding the stream to be a Rosgen Type E. A bankfull width of 18' and 2.0 entrenchment ratio was used to set the compliant span of 36'.

The environmental review identified the potential presence of endangered, threatened, or rare species, invasive species, and limited re-use soils (LRS), and potential coordination for Section 106, water quality requirements, Alteration of Terrain (AOT) requirements, and essential fish habitat (EFH). Bowman Brook has a mapped FEMA floodplain (Zone AE) with floodway. Protected shoreland buffer, prime wetlands, designated rivers, and conservation lands were not identified.

Existing hydrology and hydraulics were outlined in conjunction with the culvert, stream, and road profiles. Streamstats reports drainage area at 3.16 sq mi (2,022 acres). Review of LIDAR contours found a reduction in contributing area in the lower watershed, making the total area used for analysis 1,985.5 acres, or about 3.1 Sq miles. The SCS Method (Hydrocadd) was used for analysis, using the Cornell 24 hr rainfall predictions. The initial Hydrocadd model was from the drainage report for the Market Basket Development, completed by TF Moran in 2011. The model was modified to reflect the small reduction in drainage area previously noted, updated storage based on LIDAR, and re-calibrated to match the FEMA Q100 regulatory elevation of 249.7. The model indicated that the existing 72" culvert can pass the 100 year storm without bypass.

Several rehabilitation alternatives were considered, as well as replacement with a hydraulically sized structure, and replacement with a rules compliant structure. A fully compliant crossing would be a 36' span bridge, cost estimated at just over \$3.6 million, with significant permanent and temporary impacts including loss of existing flood storage. Replacement with a hydraulically sized culvert was estimated at \$2 million, with impacts similar to the bridge option. Hydraulic performance of several rehabilitation alternatives was compared. A cured in place liner was identified as the preferred alternative, with a current cost estimate of \$376,640.

The proposed design will slipline the entire length of the existing 72" x 119' long culvert, make minor repairs to the stone inlet and outlet headwalls, and fill any sinkholes. The liner wall thickness is typically less than one inch, and the cured liner will retain some corrugated texture. The proposed rehabilitation will not have a significant effect on capacity or velocity. There will be no effect on FEMA floodplain elevations or downstream structures. There will be no significant effect on the frequency of flooding, or sediment transport. There will be no permanent effect to the floodplain wetlands adjacent to Bowman Brook. All work will be within the existing ROW.

Temporary access roads will be required for access to the culvert inlet and outlet. Some clearing will be required, but no grubbing / stump removal is anticipated. Clearing will be minimized to the maximum extent practicable. Jurisdictional areas will be restored to existing conditions. Stream flow can be allowed to flow through or be pumped through the existing pipe for most of the project duration and during storm events. The Contractor's water diversion plan will need to allow for the pipe to be dry for a few days during insertion and curing of the liner. Total project duration is expected to be 2 to 3 months, with the majority of the time being for mobilization, access roads, erosion controls, water diversion, and restoration.

The project will be under the 1 acre threshold for earth disturbance for CGP coverage. Total disturbed area is estimated at 22,275 SF (0.51 acres), with no disturbance to existing paved areas. No permanent Impacts are proposed. Limits of temporary impacts will be about 30' upstream and 40' downstream of the existing culvert ends. Total Temporary Impacts will be about 3,194 SF, including 40 LF of channel and 96 LF of banks at the outlet for a total of 136 LF.

Concurrence was requested for project consistency under 904.09 Repair of Existing Legal Tier 3 Crossings and that there is no required mitigation.

Karl Benedict, NHDES Wetlands Bureau, noted that the proposed work appears to meet the requirements of 904.09 and that PE certification would be required and that details on restoration of temporary impacts would be required to ensure that the impacts are temporary. He also noted that a water diversion plan meeting the 2-year storm requirement may be difficult to achieve. He also requested that the proposed water surface elevation and liner inverts be shown on the wetland plans to show that the proposed liner would not cause a perch. C. Carucci replied that the proposed liner thickness would be between 5/8" to 3/4" and would not be large enough to be considered a perch. Karl also noted that an invasive species management plan would be required and that he wanted to confirm that no time of year restrictions on work in the brook would be required. C. Henderson confirmed that there were no fish species of concern that would require such restrictions.

Lorie Sommer, NHDES Wetlands Bureau noted that SADES lists this culvert as 'reduced passage', but it is not clear why. She did not have concerns with the small increase of cured material and would not suggest that mitigation be required.

Carol Henderson, NHFG noted that eastern brook trout were reported to be present, but that coordination with John Magee (NHFG) indicated that they were not considered wild eastern brook trout. She also appreciated the explanation of various slip lining methods and that the proposed cured in place liner would retain some corrugated texture.

Jeanie Brochi from Environmental Protection Agency (EPA) had no comments.

A response was not received from Jamie Sikoria (FHWA)

Jessica Bouchard (NHB) noted that the NHB check from 12/10/2020 indicated that there were records in the area but no impacts are expected for the proposed work.

Pete Steckler, The Nature conservancy (TNC), asked if the project could include access for terrestrial wildlife from the edges of the ponded areas at the inlet and outlet to the culvert. He noted that there is good quality habitat upstream and that such an improvement may be self-mitigating. C. Carucci noted that there is a 24" pipe crossing just north of the culvert that could provide terrestrial passage and that installing a wildlife shelf inside the 72" culvert was not practical due to the reduction in hydraulic capacity. P. Steckler clarified that he meant placing stepping stones along the edge of the headwalls. C. Carucci noted that placing Class B size (2' diameter) stone along the headwalls could be within the project scope and budget, but NHDOT would not want to cause unnecessary impacts or trigger mitigation. Karl Benedict felt that the concept would be a benefit and that stream impacts would be self-mitigating. He was concerned that upstream impacts to the

(PRA) floodplain wetlands adjacent to a Tier 3 stream would require mitigation. Lori Summer also agreed that the concept would be beneficial, but it was unclear as to whether mitigation would be required. C. Henderson noted that stone along the wings as discussed could be a problem for future maintenance related to removing debris at the inlet.

### **Nashua-Manchester, #40818 (Capital Corridor Rail)**

Jenn Riordan (GM2) introduced the project and the team members. The project involves the extension of MBTA commuter rail services from Lowell, MA to Manchester, NH. The project corridor is approximately 30 miles long and crosses through Lowell, Chelmsford, and Tyngsborough, MA, and Nashua, Merrimack, Bedford, and Manchester, NH. It includes 9 miles in Massachusetts and 21 miles in New Hampshire. The route follows an existing rail line that currently handles only freight. The project was formerly referred to as the Capitol Corridor Rail Project. A Federal Railroad Administration (FRA) service-level NEPA Environmental Assessment was completed in 2014, which evaluated various transit alternatives between Boston, MA and Concord, NH. The current project involves extending MBTA commuter rail service from Lowell to Manchester. Tasks include preliminary design engineering, completion of a Federal Transit Administration (FTA) NEPA Environmental Assessment, and development of a financial plan. NHDOT is the project proponent. The existing rail line and right-of-way (ROW) in MA is owned by MassDOT/MBTA and in NH is owned by Pan Am Railways. The purpose of the project is to provide mobility options and reduce congestion and emissions.

Project preliminary design is ongoing and impacts have not been determined yet. Potential improvements include track and signal upgrades, bridge and culvert work, grade crossing improvements, and ROW vegetation clearing. The rail line within the project limits was historically double-tracked. Improvements would include adding the second track back in for certain segments of the corridor. These areas are still being identified. At this point no bridges will be replaced but some may need repair. No culvert replacements have been identified but this is still being evaluated. Vegetation clearing will likely be necessary within the rail ROW. Based on field reviews, it appears that most of the clearing would be shrubs and lower-growing vegetation. Larger trees are generally located beyond the existing ROW.

Four stations and one layover facility are proposed in NH. It was noted that the specific layout at each location is still being defined and some are subject to change. The sites include:

- South Nashua Station – Two options are being considered, one adjacent to Pheasant Lane Mall and another at a redevelopment site near Spit Brook Road (former Hampshire Chemical site). The Pheasant Lane Mall site has no wetlands within the proposed limits of disturbance and is located outside of the 100-year floodplain. It is partially within the Protected Shoreland zone of the Merrimack River. The Spit Brook Road site does not have any wetlands and is located outside of the 100-year floodplain. It is located partially within the Protected Shoreland of the Merrimack River.
- Nashua Station – Located south of Crown Street. There are no significant natural resource issues. The area is currently developed and the Merrimack River is located over 800 feet away.

- Bedford/Manchester Airport Station – Located on the west side of the Merrimack River at Raymond Wieczorek Drive. Sebbs Brook and associated wetlands are located to the south and are within a 100-year floodplain. Additional wetlands have been identified north of the station near Somerville Drive. The Merrimack River is located to the east but the station is not within the Protected Shoreland zone.
- Manchester Station – Located between Granite Street and Valley Street. The area is currently developed, located outside the 100-year floodplain, and the Merrimack River is over 400 feet away.
- Manchester Layover – Two options are being considered, one located north of Hancock Street/Queen City Avenue in a portion of the abandoned Pan Am rail yard and a second option in the wooded back area of the City of Manchester's Pine Grove Cemetery. The site located north of Hancock Street is mostly developed but there are two low quality wetlands east of the tracks. This site is not located within a 100-year floodplain and the Merrimack River is approximately 250 feet west of the site at the closest point. The Pine Grove Cemetery site would be located on the east side of the tracks beyond the 100-year floodplain and outside of the Protected Shoreland zone. There are two known bald eagle nests located on Carthagina Island and there is a semi-rich oak-sugar maple exemplary natural community forest located on the west side of the tracks but not within the layover limits of disturbance. The layover would be located within the Pine Grove Cemetery Backland Conservation Land. Wetlands are located nearby but impacts have not been evaluated yet.

Natural resources within the project corridor were summarized. Wetlands were field delineated in April, May, and June of 2021. All of the corridor in Massachusetts was field delineated and about 8 miles of the NH portion was field delineated (corresponds to where improvements such as double track, proposed stations, or bridge/culvert work may occur). There are four Prime Wetlands located in Nashua. There are several Priority Resource Areas as well as many small, low functioning wetlands adjacent to the rail bed. No vernal pools were observed. There are eight named surface waters that are crossed by or located adjacent to the project, as well as at least six unnamed small perennial and intermittent stream crossings. Stream crossing assessments have not yet been completed since potential culvert replacements are still being identified. Assessments will be completed if any culvert replacements are proposed.

The project is subject to AoT requirements. New impervious surface would be located at the stations, primarily associated with any new proposed station access roads and parking. and water quality treatment would be included. The project is entirely within the MS4 permit area. Most of the surface waters near the project have impairments or TMDLs. There are no Outstanding Resource Water watersheds or Class A waters near the project.

For groundwater resources, the majority of the rail corridor is mapped as a GA2 groundwater classification area. The rail corridor in Merrimack, Bedford, and Manchester is located within a Source Water Protection Area. In Merrimack there is a water supply intake protection area and wellhead protection area. There are also various wells mapped along the corridor and near the station and layover sites.

Various plant and animal species were listed in the NHB report. Field surveys for the plant species were conducted concurrently with the wetland delineation and follow-up rare plant searches were conducted in June and August. Wild lupine was found in one location adjacent to the rail ROW in Bedford. Semi-rich oak-sugar maple forest exemplary natural community is located adjacent to the rail line near Pine Grove Cemetery (near one of the site options for the Manchester layover facility). Both appear to be located beyond the anticipated impact limits of the project, but their locations have been noted and potential impacts will be reviewed as the design progresses.

Wright's spikesedge has been recorded near the Merrimack River railroad bridge. It was not found during the wetland delineation site visit. A follow-up visit later in the growing season was attempted in August but the water levels in the river were so high that the survey could not be completed. If any work within the river is proposed, an additional survey could be completed during final design (will be included as a condition in the NEPA document).

Small whorled pogonia was listed in the first USFWS IPaC report received for the project but was not listed in a later report. GM2 searched for it during the field reviews and did not find the plant within the rail ROW.

Some coordination has already been completed with NH Fish and Game regarding the listed animal species. For brook floater, a mussel survey near the Merrimack River bridge was not included in the current phase of the project. If impacts to the river are proposed, a survey would be completed during a later phase of the project. For bald eagle, a nest was observed on Carthagina Island in Manchester. This is located approximately 500 feet from the rail ROW. For the grassland bird species, GM2 coordinated with NH Fish and Game and NH Audubon. The NHB records are in the fields near Anheuser-Busch in Merrimack. No impacts to these fields are anticipated but if work would occur in this area, then a grassland bird survey would be completed under a later phase of the project.

For northern long-eared bat, acoustic surveys are not included in the current phase of the project but would be completed under a later phase if necessary. No known maternity roost trees or hibernacula are nearby.

Other natural resources include Essential Fish Habitat for Atlantic salmon (Merrimack River, Nashua River, Pennichuck Brook, and Souhegan River). The Lower Merrimack, Souhegan, and Piscataquog Rivers are NH Designated Rivers. Large sections of the project are located adjacent to 100-year floodplains. The rail line is generally elevated above the Merrimack River and outside of floodplain. The rail line crosses floodplains at the larger perennial streams and a few other locations. Several of the waterbodies within the project limits have Protected Shoreland. Invasive plant species are present throughout the rail ROW.

Resources within the Massachusetts portion of the project were summarized. Wetlands were delineated along the entire 9-mile corridor in MA. Sections of the corridor cross through the 100-foot buffer zones of the wetlands and banks. The rail line runs parallel to the Merrimack River and crosses several perennial streams. MassWildlife Natural Heritage and Endangered Species Program (NHESP) identified two listed species: bald eagle and riverine clubtail dragonfly. A meeting was

held with MassWildlife to discuss potential impacts. Recommendations included minimizing vegetation clearing, especially along river banks, and having time-of-year restrictions.

The next steps for the project include attending a second Natural Resource Agency Coordination meeting once impacts have been identified. The NEPA document is scheduled for completion in late December 2021. Permit applications would be submitted at a later point under a separate phase of the project.

Comments were then provided by the following resource agencies.

Karl Benedict (NHDES)

- The project needs to meet the stream crossing rules (Env 900) and AoT requirements.
- There may need to be some hazardous waste management at the Spit Brook Road station site.
- Recommended focusing on the functional assessments in evaluating wetland impacts.
- Need to consider the Priority Resource Area (PRA) impacts as well as the 100-year floodplain and prime wetlands
- Recommended coordinating with the Local Advisory Committees (LACs) and Conservation Commissions. Jenn responded that the LACs and Conservation Commissions in NH were recently contacted.

Lori Sommer (NHDES)

- Agreed with Karl's comments
- Asked about the protocol for the stations regarding size. Shelly Winters clarified that the station sites would not involve a large amount of construction. No large buildings are proposed, just platforms and parking areas. Regarding the layover sites, Lori stated that the Pine Grove Cemetery location is not appealing due to heritage, landscape, and proximity to the Merrimack River.
- Asked if there was any current use on the second track. Jonathan Bruneau from Jacobs responded that the second track is currently used by Pan Am as a maintenance access road.
- PRA and prime wetland impacts will need to be looked at closely.
- Asked if the clearing of vegetation would be a one-time occurrence or if it would be maintained. Secondary impacts associated with the clearing/conversion of wetlands would be considered by the ACOE.

Carol Henderson (NH Fish and Game)

- Recommended staying in contact with the NH Fish and Game Nongame Program as the project moves forward. Suggested coordination and communication when there is more information on the disturbances.
- Nesting birds can be disturbed during construction even when their habitat is not being directly impacted (mentioned bald eagle and peregrine falcon in the city station sites)
- Asked if there is a tentative construction date. Shelley Winters responded that the financial plan is next and then it is up to the legislators to decide if the project moves forward.

Jaime Sikora (Federal Highway Administration)

- No comments due to FHWA not funding the project

Jessica Bouchard (NH Natural Heritage Bureau)

- Asked GM2 to send a record of previous communication between GM2 and NHB.
- Asked if GM2 was aware of the two new species listed in the 2021 NHB report and whether GM2 surveyed for them. Jenn Riordan confirmed that these species were included in the field surveys.
- Suggested doing an additional survey for Wright's spikesedge once Merrimack River shoreline impacts have been determined.
- Seconded Lori's comment about not preferring the Pine Grove Cemetery location for a layover site due to potential indirect impacts to the exemplary natural community.

Pete Steckler (The Nature Conservancy)

- Agreed with Carol about consulting with the NH Fish and Game Nongame Program. Noted that wildlife corridor and connectivity maps are being produced that could be useful to the project.

*This project has not been previously discussed at the Monthly Natural Resource Agency Coordination Meetings.*

### **Madbury, #43276, (X-0005(068))**

Chris Carucci, NHDOT Highway Design, gave an overview of the proposed federally funded culvert rehabilitation project. The culvert carries Beards Creek under Madbury Road, approximately 0.5 miles north of US Route 4, and is a Tier 2 crossing. The existing culvert is a 58" wide x 36" high x 131' long corrugated metal arch pipe constructed in 1980. The pipe is in poor condition with heavy rust, some perforations, and damage to the inlet end. There was no perch at the culvert inlet or outlet.

A Town owned crossing, located approximately 175' upstream on Sarah Paul Road, was also described.

NHDOT District 6 Maintenance reports no history of flooding related to the State culvert. Discussion with the Town Road Agent indicated no recent history of flooding of the Town Road, except for one time when the State culvert was blocked by beavers. A stream assessment was completed by NHDOT on 5/27/2021, finding the stream to be a Rosgen Type E immediately upstream of the crossing. Immediately downstream, the channel is not natural, as it was constructed as part of the roadway embankment. The reference reach was farther upstream of the inlet and was classified as Type F. Bankfull widths averaged 4.6' at the crossing and 5.6' for the reference reach. The reference reach data and entrenchment ratio range of 1.0 to 1.4 was used to determine the compliant span range of 5.6' to 7.8'. An 8' span was used to evaluate the compliant design option. The environmental review identified the potential presence of rare species, invasive species, and limited re-use soils (LRS), and potential coordination for Section 106, water quality requirements, Alteration of Terrain (AOT) requirements, and essential fish habitat (EFH). Floodplains, protected shoreland buffer, prime wetlands, designated rivers, and conservation lands were not identified.

Existing hydrology and hydraulics were outlined in conjunction with the culvert, stream, and road profiles. Streamstats reports drainage area at 0.42 sq mi (268.5 acres). Review of LIDAR contours found additional contributing area in the upper watershed, making the total area used for analysis 376.3 acres, or about 0.588 Sq miles. Streamstats predicts Q100 at 106 cfs using the revised 376 ac

boundary. The FHWA Regression Equations predict Q100 between 97 and 137 cfs. The SCS Method (Hydrocadd) was used for preliminary analysis, with Q100 predicted at 200 cfs. The existing culvert can pass the 100 year storm without overtopping Madbury Road. The Town crossing would be overtopped using the conservative (200 cfs) flow. The State culvert has slight backwater effect on the Town crossing, but it would not be the primary cause of the Town road being overtopped.

Considered alternatives were described including replacement with a compliant span structure and rehabilitation by sliplining. Sliplining options included polymer coated CMP liner, GRP custom size liner, and cured in place liner. Hydraulic performance of the rehabilitation alternatives was compared. The corrugated metal pipe liner was identified as the preferred alternative.

The proposed design will remove a portion of the damaged inlet end, shortening the culvert by about 7', and creating a more hydraulically efficient headwall at the inlet. The area of pipe removed will be replaced with simulated streambed material for the channel bottom and vegetated side slopes.

The remaining 124 LF of culvert will be sliplined with a 49" wide x 33" high polymer coated corrugated metal arch pipe liner. The space between the host pipe and liner will be filled with grout. The liner inverts will be about 2" higher than the existing pipe inverts.

The proposed rehabilitation will not have a significant effect on capacity or velocity. There will be no significant effect on the frequency of flooding, or sediment transport. There will be no permanent effect to the stream channel or adjacent wetlands and there will be no perch when the work is complete. All work will be within the existing ROW.

Access to the culvert will be from the edges of Madbury Rd. Slopes are relatively flat maintained grass, so no special access concerns are expected. Minimal clearing of trees greater than 3" dbh will be required. 300 SF of clearing at the outlet is estimated for the small trees and brush along the outlet channel. No grubbing / removal of stumps is anticipated. The project will be under the 1 acre threshold for earth disturbance for CGP coverage. Total disturbed area is estimated at 19,500 SF (0.44 acres). No disturbance to existing paved areas.

Temporary Impacts will be required for access, water diversion, and erosion controls, with the upstream limit along the existing woods line, to a distance of about 50' left and right of the inlet. The downstream limit is at the ROW line, about 30' from the existing outlet.

Total Temporary Impacts will be about 1,436 SF. Total Temporary LF impacts will be about 189 LF.

Concurrence was requested for project consistency under 904.08 and that there is no required mitigation.

Karl Benedict, NHDES Wetlands Bureau, asked if the upstream structure might be replaced in the future and if so would the replacement be considered in this proposed project, agreed with the preferred alternative, stated an alternative design should be considered, the need to consider terrestrial passage referencing to consider whatever Pete and Carol may have for comments, and asked about the extent of clearing at the outlet. C. Carucci responded that it is not anticipated the upstream structures would be replaced in the near future, clearing will be limited to small trees and brush at the outlet which will be allowed to grow back, and that an alternative design will also be considered. K. Benedict agreed that either 904.08 or an alternative design would not change the proposed impacts.

Lorie Sommer, NHDES Wetlands Bureau stated that if Karl's concerns could be addressed and if it could go alternative design mitigation is not required.

Carol Henderson, NHFG stated it didn't appear there was room in the culvert to address terrestrial passage and more details were needed regarding the species identified on the Natural Heritage Bureau (NHB) report. Kerry Ryan, NHDOT Bureau of Environment, stated coordination with NHFG had begun and will continue once the preferred alternative was agreed upon.

Jeanie Brochi from Environmental Protection Agency (EPA) had no comments.

A response was not received from Jamie Sikoria (FHWA) and Jessica Bouchard (NHB) when asked if they had comments.

Pete Steckler, The Nature conservancy (TNC), asked if the project could be postponed and could the 4' x 8' structure be considered if funding was not an issue in order to see how the new federal funding plays out. C. Carucci replied that the culvert is in poor condition and needs to be fixed as soon as possible to prevent failure.

# Wetland Function-Value Evaluation Form

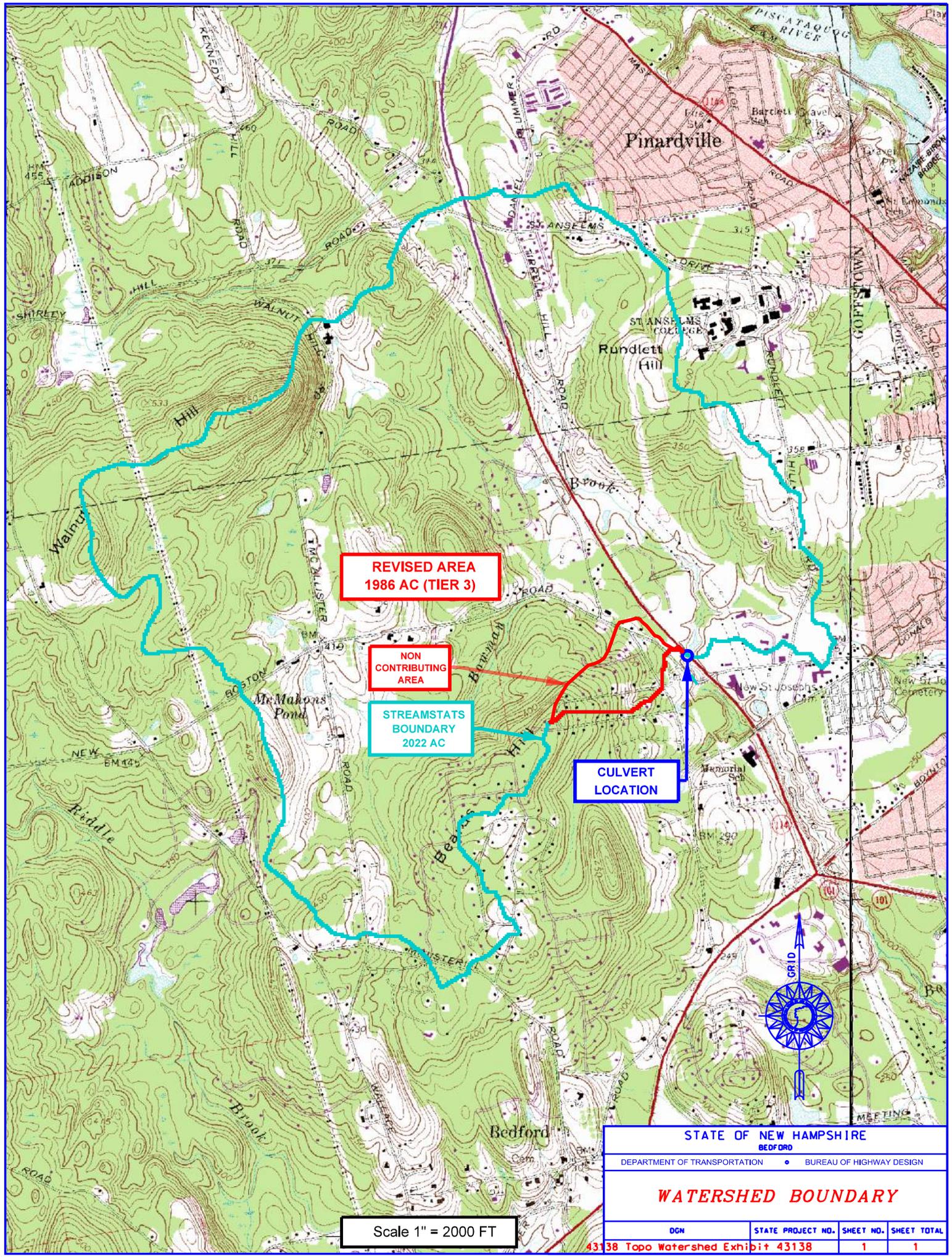
Total area of wetland 2.6 acres Human made? No Is wetland part of a wildlife corridor? Yes or a "habitat island"? No  
 Adjacent land use transportation, forest, commercial, residential Distance to nearest roadway or other development 30 ft  
 Dominant wetland systems present Palustrine Unconsolidated Bottom/ Palustrine Emergent Contiguous undeveloped buffer zone present Not complete,  
partial buffer  
 Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? Middle portion  
 How many tributaries contribute to the wetland? 2 Wildlife & vegetation diversity/abundance (see attached list)

Bedford 43138  
 Wetland I.D. Wetland A- PUB3Hh/EM1Fb  
 La 42°58'11.896"N Long 71°30'35.087"W  
 Pref Rebecca Martin Date 7/26/21  
 Wetland Impact: Temporary Area impact plan \*see  
 Evaluation based on:  
 Office \_\_\_\_\_ Field X  
 Corps manual wetland delineation completed? Y X N

Function/Value	Suitability Y / N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
 Groundwater Recharge/Discharge		4, 7, 9		Outlet is 72" culvert under NH114, road acts like an impoundment, backing up water & constraining flow.
 Floodflow Alteration	Y	5, 6, 7, 8, 9, 10, 13, 15, 16, 17	P	The wetland is wide and flat offering a lot of flood storage potential.
 Fish and Shellfish Habitat	Y	2, 4, 7, 8, 10, 14, 15, 16, 17		Downstream- P/A data 2009: Present- Blacknose dace, Creek chub, Common shiner, Common white sucker, Eastern brook trout, Slimy sculpin
 Sediment/Toxicant Retention	Y	3, 4, 5, 9, 10, 12, 13, 14	P	The wetland is a ponded area with a culvert outlet that carries Bowman Brook under NH Route 114. Water moves slowly out of the system.
 Nutrient Removal	Y	2, 3, 4, 5, 7, 10, 12, 13, 14		
 Production Export		1, 2, 10		
 Sediment/Shoreline Stabilization		2, 3, 6		
 Wildlife Habitat		3, 6, 7, 8, 9, 19		Some mosquitoes and dragonflies seen during site visit.
 Recreation		6		
 Educational/Scientific Value		11		
 Uniqueness/Heritage		1, 2, 13, 14, 21, 22		
 Visual Quality/Aesthetics		2, 11, 12		
<b>ES</b> Endangered Species Habitat				No T or E species identified by NHB as being likely to be impacted
Other				

Notes:

\* Refer to backup list of numbered considerations.



**REVISED AREA  
1986 AC (TIER 3)**

**NON  
CONTRIBUTING  
AREA**

**STREAMSTATS  
BOUNDARY  
2022 AC**

**CULVERT  
LOCATION**

Scale 1" = 2000 FT

STATE OF NEW HAMPSHIRE  
BEDFORD

DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

**WATERSHED BOUNDARY**

DGN	STATE PROJECT NO.	SHEET NO.	SHEET TOTAL
43138	Topo Watershed Exhibit 43138	1	1

**NH Department of Transportation**  
**Bureau of Highway Design**  
**Project: Bedford, #43138**  
**Env-Wt 904.09 Repair, Rehabilitation, or Replacement of Tier 3 and Tier 4 Crossings**  
**Stream Crossing Report**  
**Prepared by: Christopher Carucci, PE**

**Env-Wt 904.09(a)- The repair, rehabilitation, or replacement of tier 3 stream crossings shall be limited to existing legal crossings where the tier classification is based only on the size of the contributing watershed.**

**Crossing's Drainage Area:** 1,986 ac (3.1 Sq Mi)

**Env-Wt 904.09(b)- Rehabilitation of a culvert or other closed-bottom stream crossing structure pursuant to this section may be accomplished by concrete repair, slip lining, cured-in place lining, or concrete invert lining, or any combination thereof, except that slip lining shall not occur more than once.**

**Project Description:** The project will rehabilitate an existing 72" diameter, 119' long corrugated metal culvert carrying Bowman Brook under NH 114 located approximately 475' north of New Boston Road. The proposed design is to slipline the full length of the existing culvert with a cured in place liner. Incidental work will include minor repairs to the mortared stone headwalls at the inlet and outlet, and filling of sinkholes behind the headwalls.

**Env-Wt 904.09(c) A project shall qualify under this section only if a professional engineer certifies, and provides supporting analyses to show, that:**

- (1) The existing crossing does not have a history of causing or contributing to flooding that damages the crossing or other human infrastructure or protected species habitat;**  
The existing 72" cmp can pass the 100-year storm without bypass. The 100-year FEMA map elevation is 250 vs the bypass elevation of 253. There is no history of overtopping at the crossing.

\* See the Supplemental Narrative for detailed Hydrology / Hydraulic information.

- (2) The proposed stream crossing will:**
  - a. Meet the general criteria specified in Env-Wt 904.01;**  
*see page 2 for Env-Wt 904.01 form*
  - b. Maintain or enhance the hydraulic capacity of the stream crossing;**  
The proposed rehabilitation will result in a small increase capacity due to the lower roughness coefficient and minimal reduction in diameter for this type of liner.

**c. Maintain or enhance the capacity of the crossing to accommodate aquatic organism passage;**

The proposed rehabilitation will maintain the crossing's existing capacity to accommodate aquatic organism passage. Velocity in the culvert will increase slightly at all flows, but the difference is not significant enough to reduce passage at normal flows. At 10 cfs (a typical base flow), velocity would increase by 0.7 ft/s. The maximum increase in velocity (for the 100-year storm) is 1.8 ft/s. The proposed rehabilitation will not cause a perch at the inlet or outlet due to the liner's small thickness.

**d. Maintain or enhance the connectivity of the stream reaches upstream or downstream of the crossing; and**

The proposed rehabilitation will not alter the crossing's existing connectivity.

**e. Not cause or contribute to the increase in the frequency of flooding or overtopping of the banks upstream or downstream of the crossing.**

The proposed rehabilitation will slightly reduce the upstream headwater elevation (by a maximum of 0.2' for the 100-year storm). Increases in flow and velocity are not large enough to have a significant effect on the downstream channel or other downstream crossings.

**PE Certification**

**I hereby certify that the above referenced project meets the criteria of Env-Wt 904.09(c).**

Name: Christopher Carucci, PE

Date: 11/16/2021

**Env-Wt 904.09(d) Repair, rehabilitation, or replacement of a tier 4 stream crossing shall comply with Env-Wt 904.07(d). (if not tidal, answer N/A) N/A**

**Env-Wt 904.01 General Design Considerations  
Applicable to All Stream Crossings**

(a) All stream crossings, whether over tidal or non-tidal waters, shall be designed and constructed so as to:

1) Not be a barrier to sediment transport;

The proposed liner will not have a significant effect on sediment transport. Flow and velocity in the rehabilitated culvert will be similar to existing conditions.

2) Not restrict high flows and maintain existing low flows;

The proposed rehabilitation will not have a significant effect on the crossing's ability to convey high and low flows.

3) Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;  
The proposed rehabilitation will maintain the crossing's existing capacity to accommodate aquatic organism passage.

4) Not cause an increase in the frequency of flooding or overtopping of banks;  
The proposed rehabilitation will slightly reduce the upstream headwater elevation (by a maximum of 0.2' for the 100-year storm). Increases in flow and velocity are not large enough to have a significant effect on the downstream channel or other downstream crossings.

5) Maintain or enhance geomorphic compatibility by:  
a. Minimizing the potential for inlet obstruction by sediment, wood, or debris; and  
The proposed rehabilitation will maintain the culvert's ability to pass sediment, wood, and/or debris. The existing culvert has an inlet headwall with 45° wing walls which helps with passing debris and the reduction in diameter is minimal. The slightly smoother liner texture will also help to pass sediment and debris.

b. Preserving the natural alignment of the stream channel;  
The proposed rehabilitation will not alter the existing culvert alignment or slope. The existing culvert aligns well with the upstream and downstream channels.

6) Preserve watercourse connectivity where it currently exists;  
The existing culvert provides connectivity between the upstream and downstream channels. The proposed rehabilitation will maintain the existing connectivity.

7) Restore watercourse connectivity where:  
a. Connectivity previously was disrupted as a result of human activity(ies); and  
The proposed rehabilitation will maintain the existing connectivity.  
b. Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both;  
The proposed rehabilitation will not have a significant effect on aquatic organism passage.

8) Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and  
The proposed rehabilitation will not have a significant effect on upstream hydraulics. Increases in flow and velocity are not large enough to have a significant effect on the downstream channel or other downstream crossings. No erosion or scouring is anticipated to result upstream or downstream from the proposed project.

9) Not cause water quality degradation.  
The proposed rehabilitation will have no effect on water quality. Best management practices will be used during construction to protect water quality.

(b) For stream crossing over tidal waters, the stream crossing shall be designed to:

1) Match the velocity, depth, cross-sectional area, and substrate of the natural stream: and  
N/A – not a tidal crossing

2) Be of sufficient size to not restrict bi-directional tidal flow over the natural tide range above, below, and through the crossing. N/A – not a tidal crossing

## Martin, Rebecca

---

**From:** Large, Sarah  
**Sent:** Monday, June 28, 2021 2:20 PM  
**To:** Martin, Rebecca  
**Cc:** OSullivan, Andrew  
**Subject:** RE: Bedford 43138 Wetland Delineation Request  
**Attachments:** Bedford 43138 Reference Reach Map.pdf; Delineation\_line.zip; Point\_generic.zip; Bedford 43138 Wetlands Delineation Key with LIDAR.pdf

Good afternoon Rebecca,

Attached is a delineation key for the delineation in Bedford 43138. Also attached is the delineation file and the raw data points that include the invasive plants data you collected for your use to post process. There were two spots we discussed that we are hopeful that design/ construction can avoid with their access plan but if they intend to go beyond the toes of slopes in the two spots marked on the key those locations will need to be field delineated.

I am glad that we walked the stream reach downstream / the reach that Normandeau Associates (NA) completed their stream assessment for . We collected 4 reference bankfull width measurements that were all very similar to NA (see attached reference reach survey map). Therefore, I continue to support using NA's stream assessment and data as the stream assessment data used for this project as well since the upstream reach is a palustrine emergent diffuse system that is then narrowed and highly influenced by the many crossings under NH Route 114 and surrounding town roads. Please include NA's report and the reference reach map I created with the permit application submission.

As summarized in my prior email a compliant size crossing at this location would be a 36' span open bottom structure. Please share with Chris.

<S:\Global\B16-Environment\Trimble Downloads\Sarah L\Bedford 43138> (direct link to GIS data).

A Functions and Values Assessment needs to be completed for the upstream wetlands. The ACOE Highway Methodology can be used. The manual walks you through it.

Some notes of plants that were observed in the wetlands upstream: broadleaved cattail, royal fern, dogwood, speckled alder, cutgrass, fridge sedge, Soft bulrush, meadowsweet.

Best wishes,

Sarah  
Wetlands Program Analyst  
NH Department of Transportation  
Bureau of Environment

---

**From:** Large, Sarah  
**Sent:** Tuesday, June 22, 2021 2:25 PM  
**To:** Martin, Rebecca <Rebecca.A.Martin@dot.nh.gov>  
**Cc:** OSullivan, Andrew <Andrew.M.OSullivan@dot.nh.gov>  
**Subject:** RE: Bedford 43138 Wetland Delineation Request



# WETLANDS PERMIT APPLICATION STREAM CROSSING WORKSHEET

Water Division/Land Resources Management  
Wetlands Bureau



**RSA/Rule** RSA 482-A/ Env-Wt-900

This worksheet can be used to accompany Wetlands Permit Applications when proposing stream crossings.

<b>SECTION 1 - TIER CLASSIFICATIONS</b>	
Determine the contributing watershed size at <a href="#">USGS StreamStats</a> .	
Note: Plans for tier 2 and 3 crossings shall be designed and stamped by a professional engineer who is licensed under RSA 310-A to practice in New Hampshire.	
Size of contributing watershed at the crossing location: 1,986 acres	
<input type="checkbox"/> <b>Tier 1:</b> A tier 1 stream crossing is a crossing located on a watercourse where the contributing watershed size is less than or equal to 200 acres.	
<input type="checkbox"/> <b>Tier 2:</b> A tier 2 stream crossing is a crossing located on a watercourse where the contributing watershed size is greater than 200 acres and less than 640 acres.	
<input checked="" type="checkbox"/> <b>Tier 3:</b> A tier 3 stream crossing is a crossing that meets <b>any</b> of the following criteria: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> On a watercourse where the contributing watershed is more than 640 acres.</li> <li><input type="checkbox"/> Within a <a href="#">designated river corridor</a> unless:                         <ul style="list-style-type: none"> <li>a. The crossing would be a tier 1 stream based on contributing watershed size, or</li> <li>b. The structure does not create a direct surface water connection to the designated river as depicted on the national hydrography dataset as found on GRANIT.</li> </ul> </li> <li><input checked="" type="checkbox"/> Within a <a href="#">100-year floodplain</a> (see Section 2 below).</li> <li><input type="checkbox"/> In a jurisdictional area having any protected species or habitat (<a href="#">NHB DataCheck</a>).</li> <li><input type="checkbox"/> In a prime wetland or within a duly-established 100-foot buffer, unless a waiver has been granted pursuant to RSA 482-A:11, IV(b) and Env-Wt 706. Review the <a href="#">Wetlands Permit Planning Tool (WPPT)</a> for town prime wetland and prime wetland buffer maps to determine if your project is within these areas.</li> </ul>	
<input type="checkbox"/> <b>Tier 4:</b> A tier 4 stream crossing is a crossing located on a tidal watercourse.	
<b>SECTION 2 - 100-YEAR FLOODPLAIN</b>	
Use the <a href="#">FEMA Map Service Center</a> to determine if the crossing is located within a 100-year floodplain. Please answer the questions below:	
<input type="checkbox"/> <b>No:</b> The proposed stream crossing <i>is not</i> within the FEMA 100-year floodplain.	
<input checked="" type="checkbox"/> <b>Yes:</b> The proposed project <i>is</i> within the FEMA 100-year floodplain. Zone = AE Elevation of the 100-year floodplain at the inlet: 249.7 (Model EL) feet (FEMA El. or Modeled El.)	
<b>SECTION 3 - CALCULATING PEAK DISCHARGE</b>	
Existing 100-year peak discharge (Q) calculated in cubic feet per second (CFS): 427 CFS	Calculation method: SCS (HydroCADD)
Estimated bankfull discharge at the crossing location: 56 CFS	Calculation method: SCS 2-year storm

➡ **Note: If tier 1, then skip to Section 10** ⬅

**SECTION 4 - PREDICTED CHANNEL GEOMETRY BASED ON REGIONAL HYDRAULIC CURVES**

*For tier 2, tier 3 and tier 4 crossings only.*

Bankfull Width: 21.7 feet      Mean Bankfull Depth: 1.7 feet

Bankfull Cross Sectional Area: 37.7 square feet (SF)

**SECTION 5 - CROSS SECTIONAL CHANNEL GEOMETRY: MEASUREMENTS OF THE EXISTING STREAM WITHIN A REFERENCE REACH**

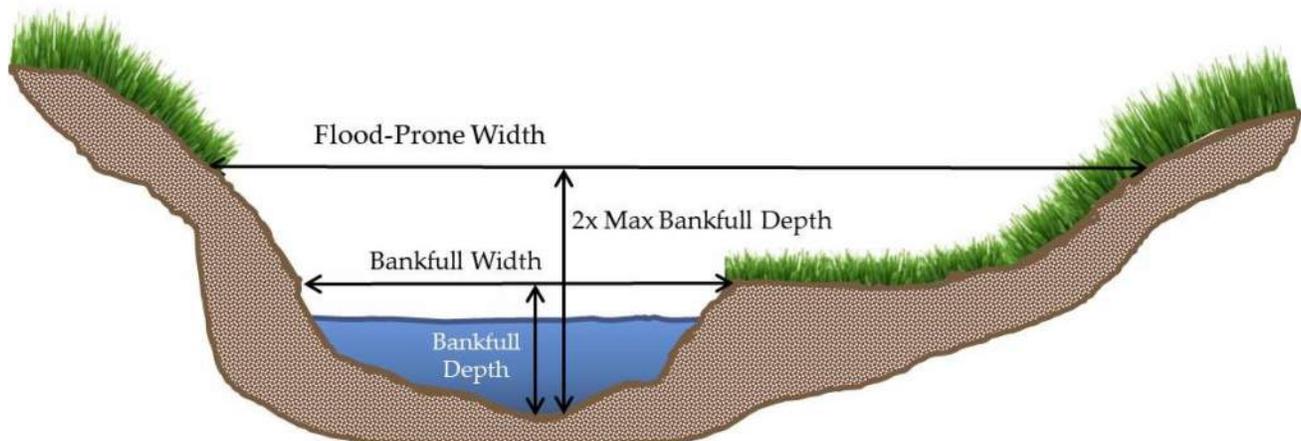
*For tier 2, tier 3 and tier 4 crossings only.*

Describe the reference reach location: C-3 approximately 1200' downstream of the crossing

Reference reach watershed size: 11183 acres

Parameter	Cross Section 1 Describe bed form C1: B4c (e.g. pool, riffle, glide)	Cross Section 2 Describe bed form C2: E4 (e.g. pool, riffle, glide)	Cross Section 3 Describe bed form C3: E4 (e.g. pool, riffle, glide)	Range
<a href="#">Bankfull Width</a>	15.7 feet	16.25 feet	17.4 feet	15.7-17.4 feet
<a href="#">Bankfull Cross Sectional Area</a>	31.4 SF	35.4 SF	36.5 SF	31.4-36.5 SF
Mean <a href="#">Bankfull Depth</a>	2 feet	2.18 feet	2.1 feet	2-2.18 feet
<a href="#">Width to Depth Ratio</a>	7.9	7.5	8.3	7.5-8.3
Max <a href="#">Bankfull Depth</a>	2.56 feet	2.75 feet	3.85 feet	2.56-3.85 feet
<a href="#">Flood Prone Width</a>	31.75 feet	193 feet	192 feet	31.75 - 193 feet
<a href="#">Entrenchment Ratio</a>	2.0	11.9	11.0	2.0-11.9

Use **Figure 1** below to determine the measurements of the Reference Reach Attributes



**Figure 1:** Determining the Reference Reach Attributes.

**SECTION 6 - LONGITUDINAL PARAMETERS OF THE REFERENCE REACH AND CROSSING LOCATION**

*For tier 2, tier 3 and tier 4 crossings only.*

Average Channel Slope of the Reference Reach: 0.8%

Average Channel Slope at the Crossing Location: 0.9% (downstream)

**SECTION 7 - PLAN VIEW GEOMETRY**

Note: Sinuosity is measured a distance of at least 20 times bankfull width, or 2 meander belt widths.

*For tier 2, tier 3 and tier 4 crossings only.*

Sinuosity of the Reference Reach: 1.21	
Sinuosity of the Crossing Location: [redacted]	
<b>SECTION 8 - SUBSTRATE CLASSIFICATION BASED ON FIELD OBSERVATIONS</b>	
<i>For tier 2, tier 3 and tier 4 crossings only.</i>	
% of reach that is bedrock:	[redacted] %
% of reach that is boulder:	[redacted] %
% of reach that is cobble:	[redacted] %
% of reach that is gravel:	predominant %
% of reach that is sand:	[redacted] %
% of reach that is silt:	[redacted] %
<b>SECTION 9 - STREAM TYPE OF REFERENCE REACH</b>	
<i>For tier 2, tier 3 and tier 4 crossings only.</i>	
Stream Type of Reference Reach:	E4 best match

Refer to Rosgen Classification Chart (**Figure 2**) below:

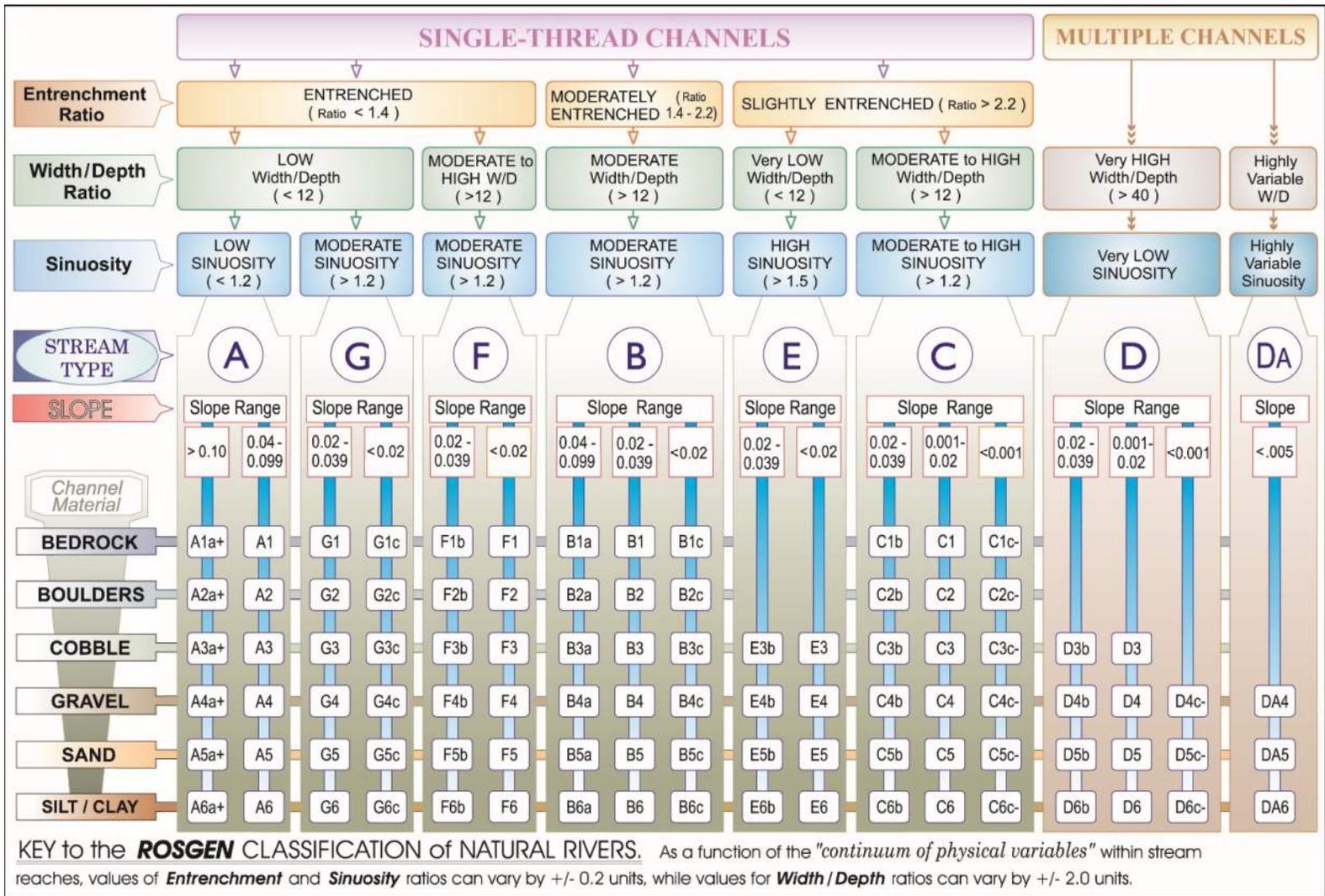


Figure 2: Reference from Applied River Morphology, Rosgen, 1996.

SECTION 10 - CROSSING STRUCTURE METRICS						
Existing Conditions	Existing Structure Type:	<input type="checkbox"/> Bridge span <input type="checkbox"/> Pipe arch <input type="checkbox"/> Open-bottom culvert <input checked="" type="checkbox"/> Closed-bottom culvert <input type="checkbox"/> Closed-bottom culvert with stream simulation <input type="checkbox"/> Other: <input type="text"/>				
	Existing Crossing Span: (perpendicular to flow)	6 feet	Culvert Diameter:	6 feet		
	Existing Crossing Length: (parallel to flow)	119 feet	Inlet Elevation:	El. 234.05 feet		
Proposed Conditions	Existing Crossing Length: (parallel to flow)	119 feet	Outlet Elevation:	El. 233.11 feet		
	Proposed Structure Type:		Culvert Slope:	0.78%		
	Bridge Span		Tier 1	Tier 2	Tier 3	Alternative Design
	Pipe Arch		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Closed-bottom Culvert		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> REHAB	<input type="checkbox"/>
	Open-bottom Culvert		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Closed-bottom Culvert with stream simulation		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Proposed Structure Span:	5.9 feet	Culvert Diameter:	5.9 feet			

(perpendicular to flow)	<b>Inlet Elevation:</b> El. 234.1 feet
<b>Proposed Structure Length:</b> 119 feet (parallel to flow)	<b>Outlet Elevation:</b> El. 233.16 feet <b>Culvert Slope:</b> 0.78%
<b>Proposed Entrenchment Ratio:</b> * no change to stream <i>For Tier 2, Tier 3 and Tier 4 Crossings Only. To accommodate the entrenchment ratio, floodplain drainage structures may be utilized.</i>	

\* Note: Proposed Entrenchment Ratio must meet the minimum ratio for each stream type listed in **Figure 3**, otherwise the applicant must address the Alternative Design criteria listed in Env-Wt 904.10.

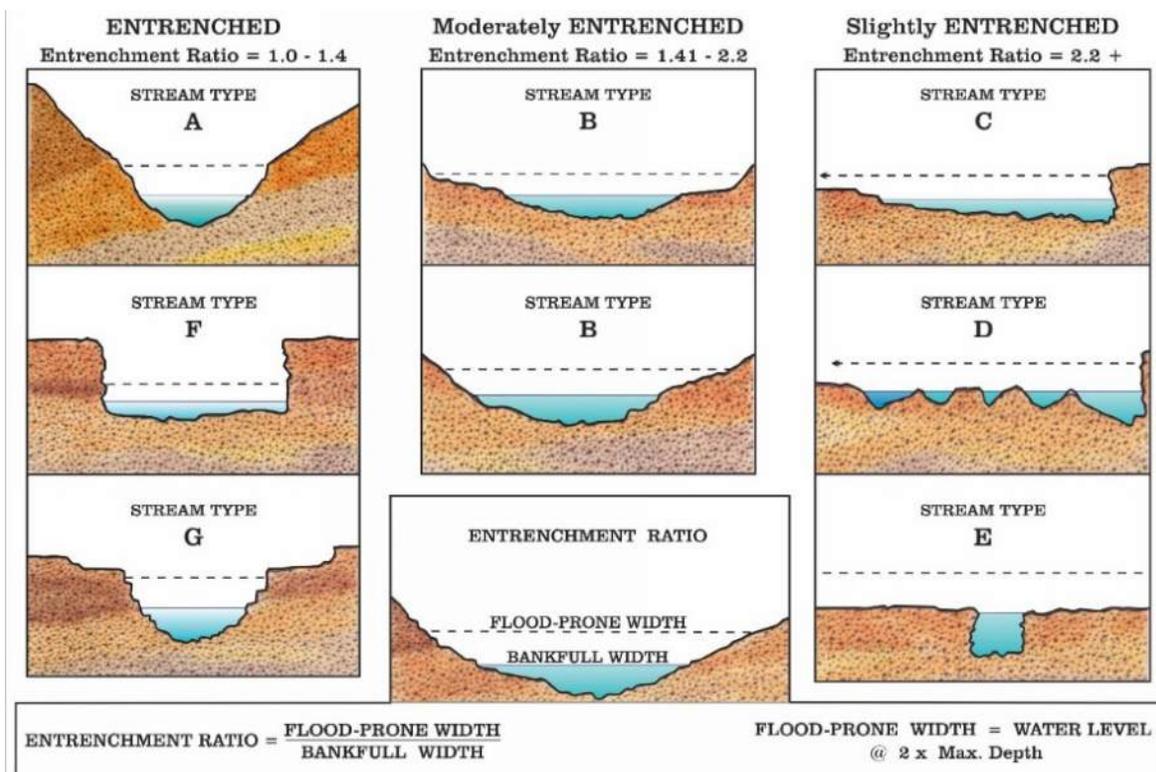


Figure 3: Reference from Applied River Morphology, Rosgen, 1996.

SECTION 11 - CROSSING STRUCTURE HYDRAULICS		
	Existing	Proposed
100 year flood stage elevation at inlet:	249.7	249.5
Flow velocity at outlet in feet per second (FPS):	15.1	16.88
Calculated 100 year peak discharge (Q) for the <i>proposed</i> structure in CFS:		450
Calculated 50 year peak discharge (Q) for the <i>proposed</i> structure in CFS:		414
SECTION 12 - CROSSING STRUCTURE OPENNESS RATIO		
<i>For tier 2, tier 3 and tier 4 crossings only.</i>		
<b>Crossing Structure Openness Ratio*</b> = 27.34sf/119' = 0.23		
* Openness box culvert = (height x width)/length Openness round culvert = (3.14 x radius <sup>2</sup> )/length		

### SECTION 13 - GENERAL DESIGN CONSIDERATIONS

Env-Wt 904.01 requires all stream crossings to be designed and constructed according to the following requirements. Check each box if the project meets these general design considerations.

All stream crossings shall be designed and constructed so as to:

- Not be a barrier to sediment transport.
- Prevent the restriction of high flows and maintain existing low flows.
- Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction.
- Not cause an increase in the frequency of flooding or overtopping of banks.
- Maintain or enhance geomorphic compatibility by:
  - a. Minimizing the potential for inlet obstruction by sediment, wood, or debris, and
  - b. Preserving the natural alignment of the stream channel.
- Preserve watercourse connectivity where it currently exists.
- Restore watercourse connectivity where:
  - a. Connectivity previously was disrupted as a result of human activity(ies), and
  - b. Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both.
- Not cause erosion, aggradation, or scouring upstream or downstream of the crossing.
- Not cause water quality degradation.

### SECTION 14 - TIER-SPECIFIC DESIGN CRITERIA

Stream crossings must be designed in accordance with the tier specific design criteria listed in Part Env-Wt 904.

- The proposed project meets the tier specific design criteria listed in Part Env-Wt 904 and each requirement has been addressed in the plans and as part of the wetland application.

### SECTION 15 - ALTERNATIVE DESIGN

**NOTE:** If the proposed crossing does not meet all of the general design considerations, the tier specific design criteria, or the minimum entrenchment ratio for each given stream type listed in **Figure 3**, then an alternative design plan and associated requirements must be addressed pursuant to Env-Wt 904.10.

- I have submitted an alternative design and addressed each requirement listed in Env-Wt 904.10.

# Bedford #43138



Delineated by Sarah Large, NHDOT Wetlands Program Analyst, 6/24/2021 in accordance with Env-Wt 406





## Stream Crossing Assessment Bowman Brook, Bedford, NH

**Prepared For:**  
Fay, Spofford, & Thorndike, Inc  
288 South River Road, Building C  
Bedford, NH 03110

**Submitted On:**  
November 12, 2013

**Prepared By:**  
Normandeau Associates, Inc.  
25 Nashua Road  
Bedford, NH 03110

[www.normandeau.com](http://www.normandeau.com)

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<b>ATTACHMENT B: Stream Crossing Assessment Worksheet and Data</b>	

## Introduction

In December 2012, data was collected at Bowman Brook in Bedford, NH to characterize the stream on either side of its passage under Route 114. A subsurface road crossing present for the brook is being targeted by NH Department of Transportation (NHDOT) for rehabilitation or replacement. Due to development in the area, the reference reach proposed for use in the characterization was located 100 to 500 feet upstream of the present crossing. The crossing currently consists of a round corrugated metal culvert with a 7.5 foot opening and the pipe run is approximately 200 feet in length. This report presents the results of a stream assessment using the form titled NHDOT Stream Field Worksheet, dated 2010 and revised May 2011.

Under the Stream Crossings rules (Chapter Env-Wt 900), the proposed replacement of the existing culvert that channels Bowman Brook below Route 114 meets the requirements of a replacement Tier 3 major impact project. For the replacement of an existing legal stream crossing, the Stream Crossings rules require that an assessment of the geomorphic compatibility of the existing stream channel be performed based on the NH Stream Crossing Guidelines (UNH 2009).

## Methods

Six representative cross-sections were located along the brook; three upstream of the culvert, one just before the inlet, one just beyond the outlet, and one downstream of the culvert. Locations of the cross-sections are shown on Plan A and profiles of the cross-sections are shown on Plan B. At each cross-section location, the bankfull elevation and floodprone area were interpreted and flagged based on evidence along the bank. The flags were ground surveyed at a later date by NHDOT. Other characterization calculations were also completed at each section, including the entrenchment ratio, the width to depth ratio and the maximum bankfull depth. These data are presented below the graphic interpretation of each cross-section. Attachment A contains Plans A and B as well as the longitudinal profile. Attachment B contains a completed NHDOT Stream Crossing Assessment Worksheet and supporting data. A spreadsheet showing the data reductions is also included in this attachment.

## Results

Based on the assessment results, the two most upstream cross-sections (at 0+250 and 0+400) were classified as E4 stream forms in accordance with the Rosgen (1996) stream classification system. It should be noted that the sinuosity of the brook in this reach was lower than a typical E4 channel. Typical E4 channels have sinuosity of >1.5. In this reach of the brook the sinuosity was measured to be 1.21 (242 feet of channel thread over a 200 foot valley slope). The brook appeared stable at each of these cross-section locations with no large sloughs or bank erosion noted. The cross-section at 0+75 was classified as a B4c stream type. The south bank at this cross-section location was exhibiting instability in the form of

an eroding bank face. This area of the brook may be influenced by the nearby culvert approximately 75 feet downstream.

The longitudinal profile downstream of the culvert crossing indicates a steepening of the gradient to approximately 2.9% as measured between the tops of riffles at 0+24 (24 feet downstream of the culvert outlet) and 0+102 downstream of the outlet. This portion of the brook drains into a power line right-of-way that was constructed in the past and the surrounding wetland cover type is scrub-shrub (vs. forest upstream of the culvert). This disturbance of the land by the ROW construction or the elevated location of discharge from the culvert (due to the amount of fill needed for the road) may be responsible for this increase in gradient in this segment of the stream.

The segment of stream from 0+425 to 0+150 appears to be have fewer influences from anthropogenic changes, and was therefore used as the reference segment. The longitudinal profile (Attachment A) indicates the gradient of approximately 0.9 percent (2.35 feet over 275 feet) between the tops of riffles in the reference reach (from 150 feet upstream of the crossing to 425 upstream of the crossing). The scour potential based on riffle top heights and pool depths appears to be about 2.8 feet in the reference reach. See the attached profile plan for a graphical depiction of this.

Due to their distance from culvert influences, the upper most two cross-sections (CS-2 at 0+250 and CS-3 at 0+400) likely represent the most natural bankfull widths for this section of the stream system. The measured bankfull widths at these two upper most cross-sections were very comparable at 16.25 feet and 17.4 feet. The floodprone widths at both of these locations were also comparable and almost identical at 192 feet and 193 feet.

One other observation of note is the pebble counts completed with each transect show a predominance of fine gravel in the brook substrate, 100 feet upstream and beyond, of the culvert. Coarser gravel was dominant at the inlet, in the structure and downstream of it. The D50 for the area upstream of the culvert was evaluated to be 0.007 feet (Appendix B). The D50 of the material at the culvert inlet and outlet cross-sections was 0.132 feet reflecting the larger particle sizes of substrate in these locations. This may be occurring for a number of reasons. Coarser materials may be accumulating at the entry of the culvert due to the ribbed nature and undersized opening of the corrugated culvert causing friction that does not allow the natural bed transport. The force of water exiting the culvert is likely responsible for the dominance of coarser gravel at just beyond the outlet of the culvert and 100 feet downstream. Because the culvert is undersized, increased velocities of water exiting the culvert likely have a “fire hose effect” on the substrate during high flow event, washing away the finer materials.

## **Design Considerations**

The bankfull width in the chosen reference reach, upstream of the crossing, was measured to be 16.5 feet to 17.4 feet. This indicates that the stream, in its current state, should have a bankfull width close to this size to retain its natural morphology. Several regulatory guidelines recommend that stream crossing structures be at least 1.2 times the bankfull width of the stream including the U.S. Army Corps of Engineers Draft Stream Crossing Best Management Practices dated 6/10/13.

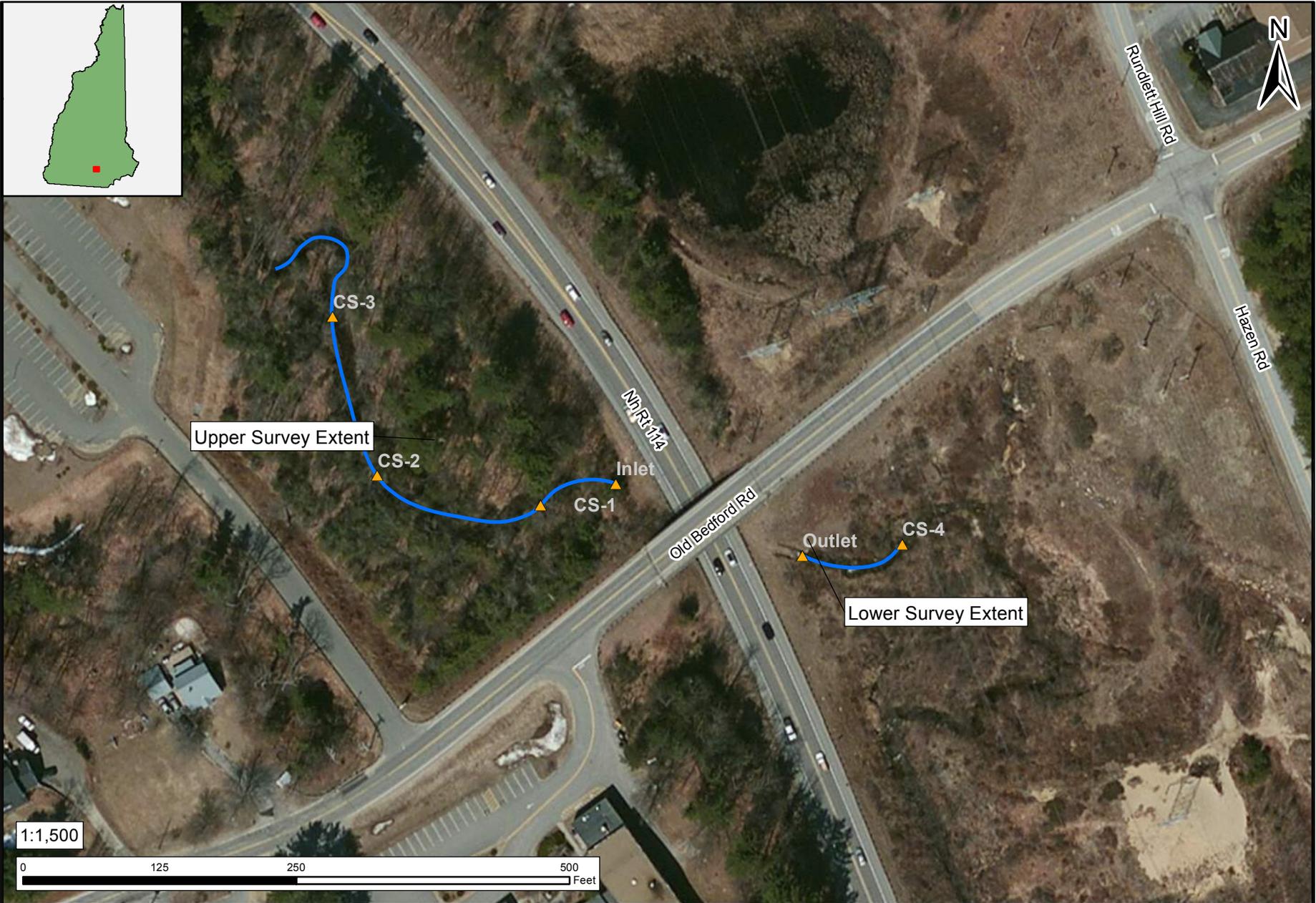
The New Hampshire Stream Crossing Guidelines take the incorporation of morphology into crossing design a step further by providing considerations for crossing designs specific to the Rosgen Stream Type Classifications. The reference reach was found to most closely match an E type stream while data from the stream closer to the culvert (inlet, outlet and approximately 100 feet up and downstream of the crossing) match a B type stream. The New Hampshire Stream Crossing Guidelines recommend the width of the crossing to be 1.2 times the bankfull width plus 2 feet for both B and E type streams. The guidelines also offer important considerations for crossing designs, particularly for crossing in an E type stream which can be susceptible to changes into other channel types if the channel dimensions are altered. The guidelines mention the use of floodplain culverts in E type stream to alleviate floodflows. That may be a viable consideration in this setting.

## References

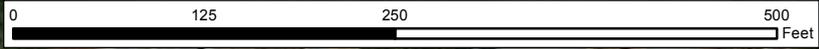
- Rosgen, D. 1996. Applied river morphology. Wildlife Hydrology, Pagosa Springs, Colorado.
- University of New Hampshire. 2009. NH Stream Crossing Guidelines.  
<http://des.nh.gov/organization/divisions/water/wetlands/documents/nh-stream-crossings.pdf>

# Attachment A

## Plans and Profile

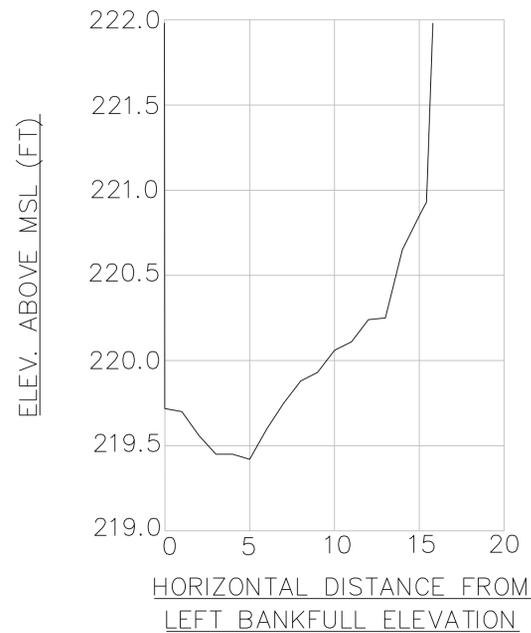


1:1,500



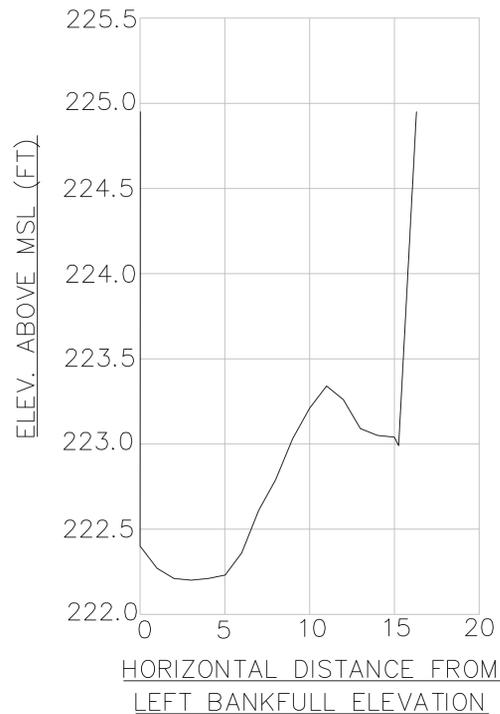
	<b>Survey Features</b> Survey Points Stream Delineation	Data provided by: GRANIT & ESRI	<b>Rt 114 Bowman Brook Culvert Replacment</b> <b>Limits of Stream Survey</b> <i>Bedford, NH</i>
		Project Number: 22263.00	

J:\Projects\RR114\_BedfordNH\22263.000\_SurveyExtent\_11113.mxd



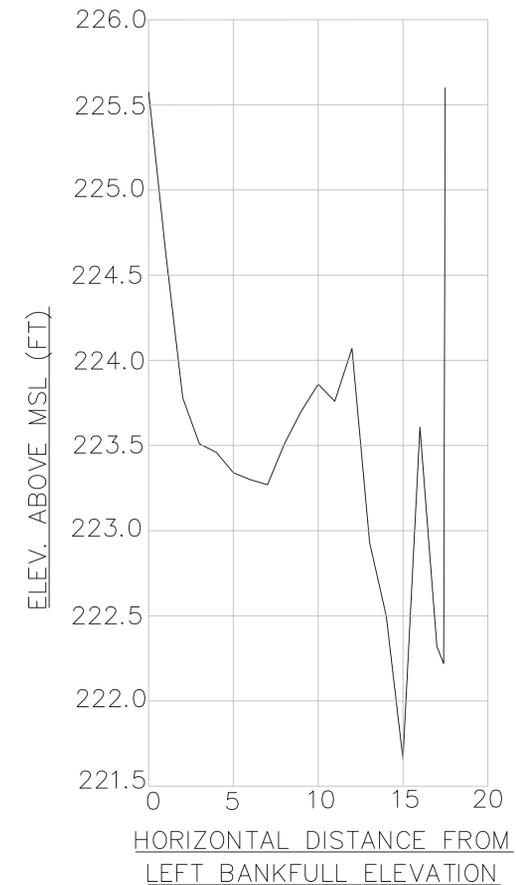
REFERENCE UPSTREAM  
CS-1 AT 0+75

WATERSHED SIZE: 11183 AC  
 MAX BANKFULL DEPTH: 2.56  
 BANKFULL WIDTH: 15.7  
 FLOODPRONE WIDTH: 31.75  
 ENTRENCHMENT RATIO: 2.0  
 AVERAGE BANKFULL DEPTH: 2  
 WIDTH/DEPTH RATIO: 7.9  
 SINUOSITY: 1.21  
 ROSGEN CLASSIFICATION: B4c BEST MATCH; W/D RATIO NO WITHIN CRITERIA  
 PREDOMINANT SUBSTRATE: GRAVEL  
 APPROXIMATE WATER ELEV.: 220.34



REFERENCE UPSTREAM  
CS-2 AT 0+250

WATERSHED SIZE: 11183 AC  
 MAX BANKFULL DEPTH: 2.75  
 BANKFULL WIDTH: 16.25  
 FLOODPRONE WIDTH: 193  
 ENTRENCHMENT RATIO: 11.9  
 AVERAGE BANKFULL DEPTH: 2.18  
 WIDTH/DEPTH RATIO: 7.5  
 SINUOSITY: 1.21  
 ROSGEN CLASSIFICATION: E4 SINUOSITY DOES NOT MEET CRITERIA  
 PREDOMINANT SUBSTRATE: GRAVEL  
 APPROXIMATE WATER ELEV.: 223.3



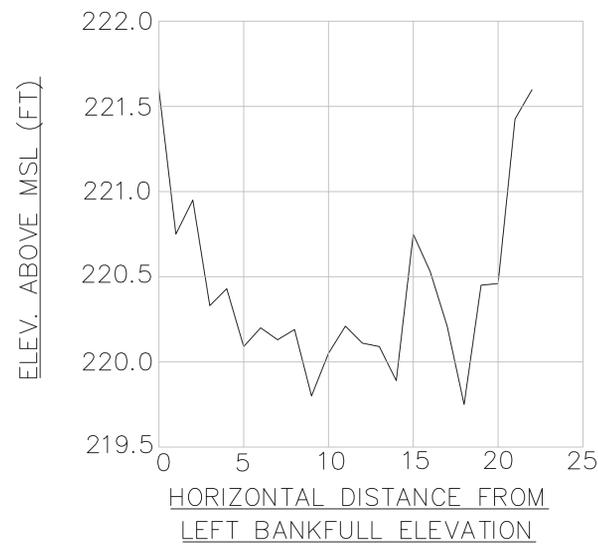
REFERENCE UPSTREAM  
CS-3 AT 0+400

WATERSHED SIZE: 11183 AC  
 MAX BANKFULL DEPTH: 3.85  
 BANKFULL WIDTH: 17.4  
 FLOODPRONE WIDTH: 192  
 ENTRENCHMENT RATIO: 11.0  
 AVERAGE BANKFULL DEPTH: 2.1  
 WIDTH/DEPTH RATIO: 8.3  
 SINUOSITY: 1.21  
 ROSGEN CLASSIFICATION: E4 BEST MATCH; SINUOSITY DOES NOT MEET CRITERIA  
 PREDOMINANT SUBSTRATE: GRAVEL  
 APPROXIMATE WATER ELEV.: 224.6

NOTE:  
 WATER LEVELS ARE FROM 12/14/12 OR 12/20/12

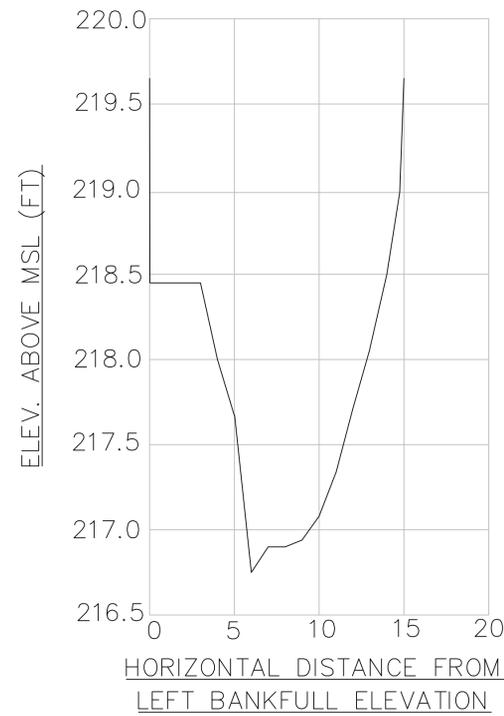
HORIZONTAL SCALE: 1" = 5'  
 VERTICAL SCALE: 1" = 1'

REVIEWING AGENCY:	Prepared By:   25 Nashua Road Bedford, New Hampshire 03110-5500	REVISION	DATE	DRAWN BY	REV. BY	CROSS-SECTION PLAN A  NH RT. 114 - BOWMAN BROOK BEDFORD, NH  DATE: 11/11/2013
AUTHORIZED BY:						
DATE:						
		NORMANDEAU PROJECT#	DRAWN BY	REVIEWED BY	SHEET NO.	TOTAL SHEETS
		22263.000	DLP	TB	1	3



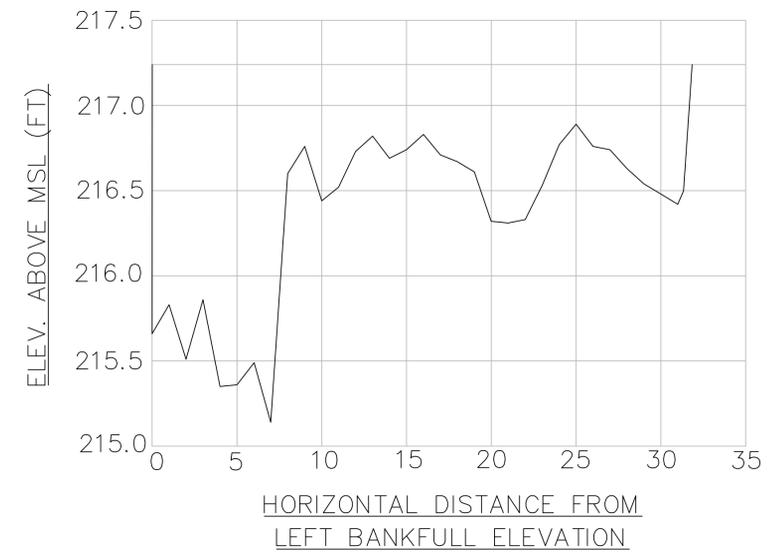
INLET SECTION

WATERSHED SIZE: 11183 AC  
 MAX BANKFULL DEPTH: 1.86  
 BANKFULL WIDTH: 20.75  
 FLOODPRONE WIDTH: 30.3  
 ENTRENCHMENT RATIO: 1.5  
 AVERAGE BANKFULL DEPTH: 1.28  
 WIDTH/DEPTH RATIO: 16.2  
 SINUOSITY: 1.21  
 ROSGEN CLASSIFICATION: B4c  
 PREDOMINANT SUBSTRATE: GRAVEL  
 APPROXIMATE WATER ELEV.: 221.4



OUTLET SECTION

WATERSHED SIZE: 11183 AC  
 MAX BANKFULL DEPTH: 2.9  
 BANKFULL WIDTH: 15.25  
 FLOODPRONE WIDTH: 28.55  
 ENTRENCHMENT RATIO: 1.9  
 AVERAGE BANKFULL DEPTH: 1.88  
 WIDTH/DEPTH RATIO: 8.1  
 SINUOSITY: 1.21  
 ROSGEN CLASSIFICATION: B4c BEST MATCH; W/D RATIO NOT WITHIN  
 PREDOMINANT SUBSTRATE: COBBLE  
 APPROXIMATE WATER ELEV.: 219.54



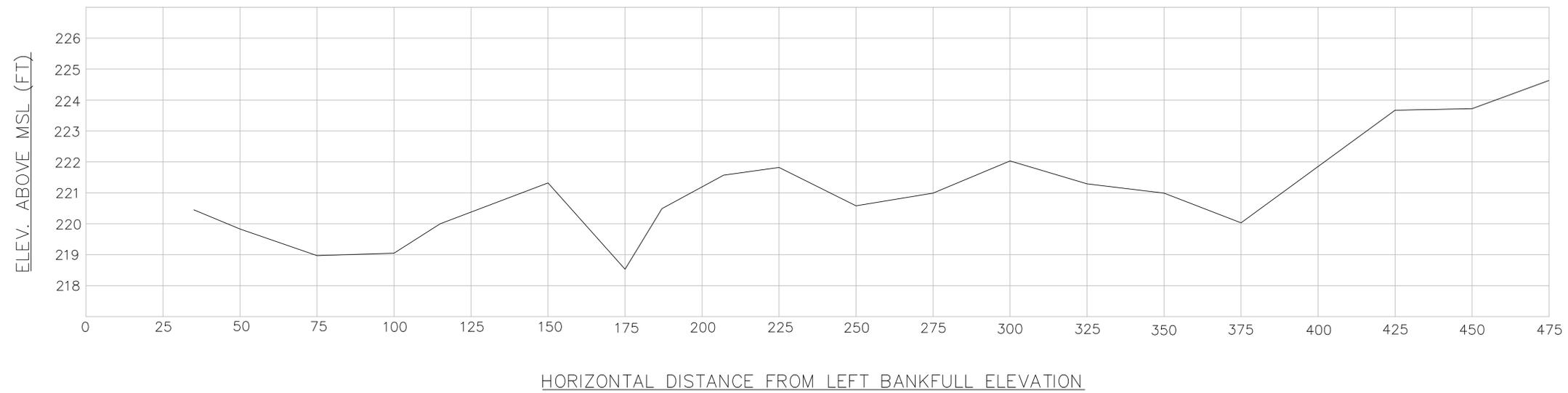
0+98 FEET DOWNSTREAM  
 OF OUTLET

WATERSHED SIZE: 11183 AC  
 MAX BANKFULL DEPTH: 2.1  
 BANKFULL WIDTH: 31  
 FLOODPRONE WIDTH: 48.75  
 ENTRENCHMENT RATIO: 1.6  
 AVERAGE BANKFULL DEPTH: 1  
 WIDTH/DEPTH RATIO: 14.8  
 SINUOSITY: 1.21  
 ROSGEN CLASSIFICATION: B3c  
 PREDOMINANT SUBSTRATE: COBBLE  
 APPROXIMATE WATER ELEV.: 216.2

NOTE:  
 WATER LEVELS ARE FROM 12/14/12 OR 12/20/12

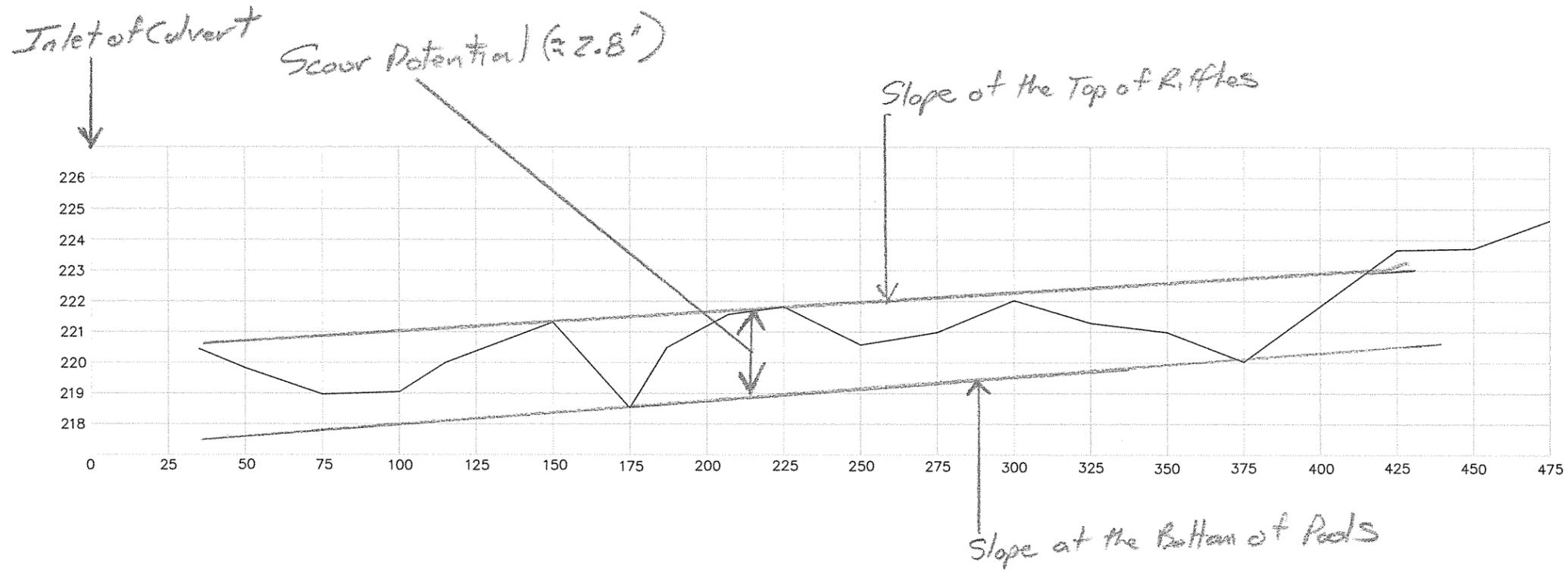
HORIZONTAL SCALE: 1" = 5'  
 VERTICAL SCALE: 1" = 1'

REVIEWING AGENCY:	Prepared By:	 25 Nashua Road Bedford, New Hampshire 03110-5500	REVISION	DATE	DRAWN BY	REV. BY	<b>CROSS-SECTION PLAN B</b>  <i>NH RT. 114 - BOWMAN BROOK          BEDFORD, NH</i>  DATE: 11/11/2013	
AUTHORIZED BY:								
DATE:								
			NORMANDEAU PROJECT#	DRAWN BY	REVIEWED BY	SHEET NO.	TOTAL SHEETS	
			22263.000	DLP	TB	2	3	



HORIZONTAL SCALE: 1" = 20'  
 VERTICAL SCALE: 1" = 2'

REVIEWING AGENCY:	Prepared By:  25 Nashua Road Bedford, New Hampshire 03110-5500	REVISION	DATE	DRAWN BY	REV. BY	PROFILE PLAN NH RT. 114 - BOWMAN BROOK BEDFORD, NH										
AUTHORIZED BY:							DATE: 11/11/2013									
DATE:							<table border="1"> <tr> <td>NORMANDEAU PROJECT#</td> <td>DRAWN BY</td> <td>REVIEWED BY</td> <td>SHEET NO.</td> <td>TOTAL SHEETS</td> </tr> <tr> <td>22263.000</td> <td>DLP</td> <td>TB</td> <td>3</td> <td>3</td> </tr> </table>	NORMANDEAU PROJECT#	DRAWN BY	REVIEWED BY	SHEET NO.	TOTAL SHEETS	22263.000	DLP	TB	3
NORMANDEAU PROJECT#	DRAWN BY	REVIEWED BY	SHEET NO.	TOTAL SHEETS												
22263.000	DLP	TB	3	3												



HORIZONTAL SCALE: 1" = 20'  
 VERTICAL SCALE: 1" = 2'

REVIEWING AGENCY:  
 AUTHORIZED BY:  
 DATE:

Prepared By:



25 Nashua Road Bedford, New Hampshire 03110-5500

REVISION	DATE	DRAWN BY	REV. BY

PROFILE PLAN

NH RT. 114 - BOWMAN BROOK  
 BEDFORD, NH

DATE: 10/28/2013

NORMANDEAU PROJECT#	DRAWN BY	REVIEWED BY	SHEET NO.	TOTAL SHEETS
22263.000	ILP	IB	3	3

## **Attachment B**

### **Stream Crossing Assessment Worksheet and Data**

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Rte 114 Bedford

Location of Crossing Rte 114

Date of field assessment 12-14-2012

Stream Parameters at Crossing

Existing Crossing (type and size): = 7.4' Upper 7.82' outlet

Watershed size \_\_\_\_\_

- CMP
- RCP
- HDPE
- Arch/Squash Pipe
- Closed Box
- Open Box
- Bridge
- Other \_\_\_\_\_

General Information to be collected at the Crossing:

GPS Wetland Delineation:  YES  NO

Riparian Zone (surrounding or on the banks):

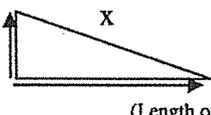
Extent of vegetation (circle): absent, low density, moderate density, high density

Type of dominant vegetation (circle): graminoid, herbaceous, shrub/sapling, tree

Tree

Dominant Species:

Slope at crossing: \_\_\_\_\_ (Rise in Elev.) \_\_\_\_\_

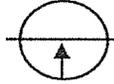


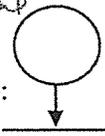
(Length of Crossing)

7.4 Inlet Ridge to Ridge

7.82 outlet Top to Bottom NO material

Outlet Data:

Depth of water at invert if not perched: 1.55 (example): 

Perched at outlet?  YES  NO (If yes, Distance from invert to the waters surface: NA) (example): 

Tailwater Controls present at crossing?  YES  NO

Pool Configuration: width \_\_\_\_\_ length: \_\_\_\_\_ Max pool depth at outlet: \_\_\_\_\_

Location (distance from outlet): \_\_\_\_\_ Materials: \_\_\_\_\_

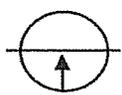
Dominant Channel Material (visual assessment):  sand  silt  gravel  cobble  boulder  bedrock

Pebble Count:  YES  NO (Collect Data on Pg. 2)

- Photo of Outlet Structure
- Photo of Downstream Conditions

Outlet Cross Section (Use Pg. 3 to collect Data)

Inlet Data:

Depth of water at inlet: 0.62 (example):  believe at bottom of 6.52' top of culvert to water surface

Dominant Channel Material (visual assessment):  sand  silt  gravel  cobble  boulder  bedrock

Pebble Count:  YES  NO (Collect Data on Pg. 2)

- Photo of Inlet Structure P1
- Photo of Upstream Conditions P2

P3 - view at inlet cross section

Inlet Cross Section (Use Pg. 4 to collect Data) P. 3

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project: NHDOT Route 114 Culvert Replacement

Location of Crossing: Rt. 114, Bedford, NH

Date of field assessment: Fall, 2012

Inlet Cross Section (Use Pg. 4 to collect Data)

**At Crossing Pebble Counts:** - measure at least 100 “pebbles” along a channel cross-section when possible (counts are usually done in riffles); measure the first “pebble” you touch at the end of your foot as you work your way across the channel; substrate is measured along the intermediate axis (neither the longest nor the shortest of the three perpendicular axes)

Pebble Count Transects (in descending order)

Up-Stream:

- a) Between 1+25 and 1+50 (riffle) reference
- b) Between 0+50 and 0+75 (pool)
- c) Between 0+25 and 0+50 (run)
- d) Between 1+00 and 1+25 (run) reference
- e) Between 2+25 and 2+50 (pool) reference
- f) Between 3+75 and 4+00 (run) reference
- g) Between 3+00 and 3+25 (run) reference
- h) Between 2+75 and 3+00 (run) reference
- i) Between 1+50 and 2+00 (riffle) reference
- j) At Station 1+50 (pool) reference

Down-Stream

- a) Between culvert and 0+25 (run)
- b) Between 0+25 and 0+50 (riffle)
- c) Between 1+00 and 1+25 (riffle)
- d) Between 0+75 and 1+00 (pool)
- e) Between 0+50 and 0+75 (run)

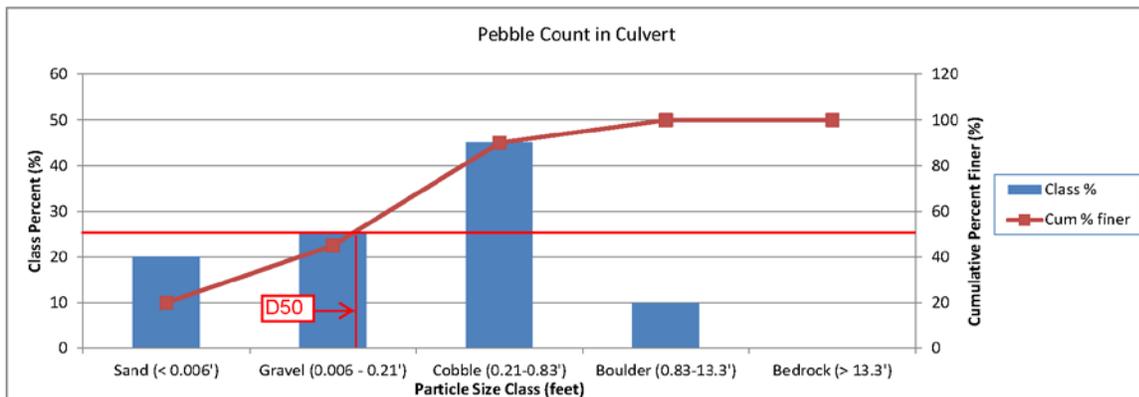
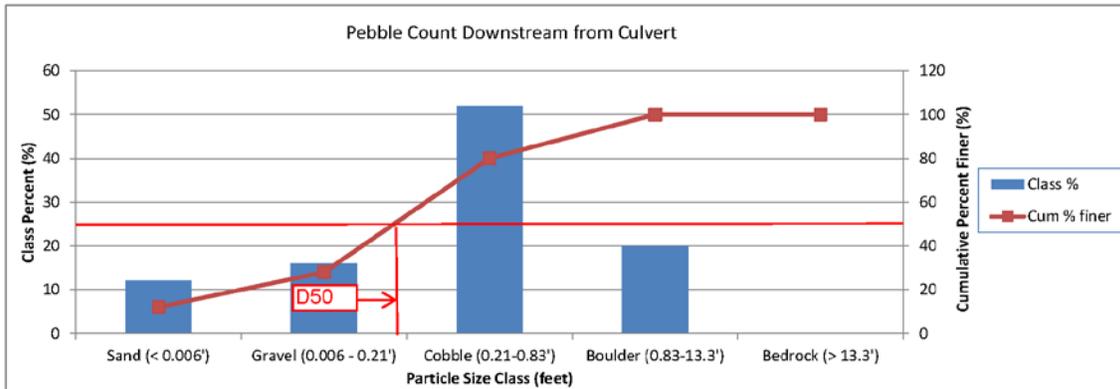
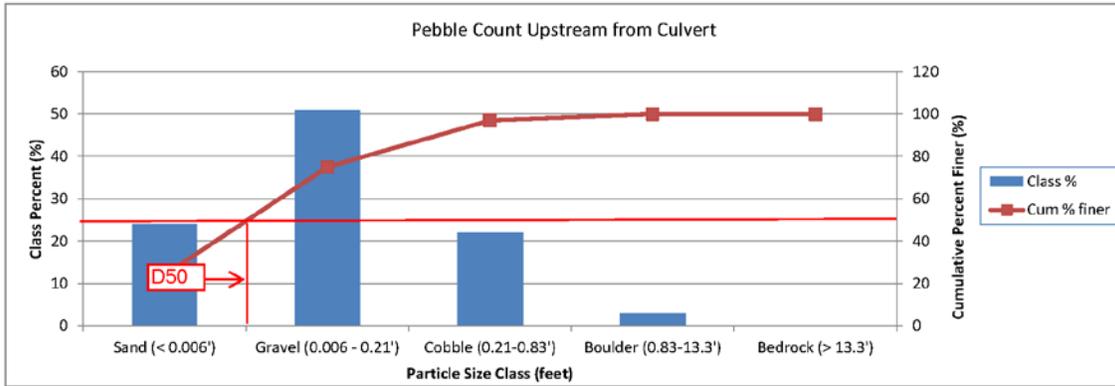
Adjacent to Structure

- a) Culvert-upstream
- b) Culvert-downstream



Route 114, Bedford, NH Pebble Count

Particle Size (ft)	Upstream			Downstream			In Culvert		
	Pebble Counts	Class %	Cum % finer	Pebble Counts	Class %	Cum % finer	Pebble Counts	Class %	Cum % finer
Sand (< 0.006')	24	24	24	6	12	12	4	20	20
Gravel (0.006 - 0.21')	51	51	75	8	16	28	5	25	45
Cobble (0.21-0.83')	22	22	97	26	52	80	9	45	90
Boulder (0.83-13.3')	3	3	100	10	20	100	2	10	100
Bedrock (> 13.3')	0	0	100	0	0	100	0	0	100
Total	100	-	-	50	-	-	20	-	-



NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Rte 114

Location of Crossing INlet

Date of field assessment 12-14-2012

Outlet  
**Outlet Cross Section:**

Starting bank (left/right)		Total/water		
Dist. from bank (ft.)	Dbf			
1	0.85/DRY		33	
2	0.65/DRY	Rock	34	
3	1.27/DRY		35	
4	1.17/DRY		36	
5	1.51/DRY		37	
6	1.40/DRY		38	
7	1.47/0.15'	Edw = 6.55' 1.50/0.20	39	
8	1.41/0.13		40	
9	1.80/0.53		41	
10	1.55/0.15		42	
11	1.39/0.08	rock	43	
12	1.50/0.15		44	
13	1.52/0.14		45	
14	1.72/0.40		46	
15	0.86/-	ROCK	47	
16	1.08/-	ROCK	48	
17	1.40/-	ROCK	49	
18	1.86/0.36		50	
19	1.16/ROCK	Edw = 18.65'	51	
20	1.15/DRY	1.89/0.35	52	
21	0.17/DRY		53	
22	22.0'	BKF left	54	
23			55	
24			56	
25			57	
26			58	
27			59	
28			60	
29			61	
30			62	
31			63	
32			64	
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			88	
			89	
			90	

Avg Dbf = 1.28  
 Max water depth = 1.5  
 Ctr of structure @: 11.85' (from R.B.)  
 Wbf = 20.75  
 Flood Prone Width = 30.3

1.24/0.15

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project

Rte 114

Location of Crossing

Rte 114 Bedford

Date of field assessment

12.14.2012

Outlet  
Inlet Cross Section:

Bedford

OUTLET

Starting bank (left/right)

RB = 0.0

Dist. from bank (ft.)	Dbf
1	1.20/0.11
2	1.20/0.10
3	1.33/0.26
4	1.65/0.61
5	1.98/1.02
6	2.90/1.98
7	2.75/1.86
8	2.75/1.89
9	2.71/1.89
10	2.57/1.76
11	2.31/1.54
12	1.94/1.22
13	1.68/0.90
14	1.39/0.74
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0.71/dry  
EDW = 0.85  
1.03/0.0

EDW-LB = 14.75'  
0.67/0.0  
LB = 15.25  
0.64/0.0

edge of water →  
11.0

33	
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48	Downstream 20+98
49	0 1.58/0.71
50	1 1.44/0.62
51	2 1.73/1.00
52	3 1.38/0.70
53	4 1.89/1.04
54	5 1.88/1.02
55	6 1.75/0.90
56	7 2.10/0.24
57	8 0.64/dry
58	9 0.48/dry
59	10 0.80/dry
60	11 0.88/dry
61	12 0.57/dry
62	13 0.58/dry
63	14 0.71/dry
64	15 0.66/dry
65	16 0.57/dry
66	17 0.69/dry
67	18 0.73/dry

Swampy Rightbank

Boulder  
" "  
cobble

68	19 0.79/dry
69	20 1.08/dry
70	21 1.09/dry
71	22 1.07/dry
72	23 0.87/dry
73	24 0.83/dry
74	25 0.51/dry
75	26 0.64/dry
76	27 0.66/dry
77	28 0.77/dry
78	29 0.86/dry
79	30 0.92/dry
80	31 0.98/dry
81	32 0.70/dry
82	33 0.31/dry
83	34 0.29/dry
84	35 34.95 end
85	11.55' end
86	
87	
88	
89	
90	

Avg Dbf = 1.85  
Max water depth = 1.98  
Ctr of structure @: ≈ 7.8'  
Wbf = 15.25  
Flood Prone Width = 28.55'  
3.96' 2X BK L to 2X BK R

- P16 - view across transect R-L
- P17 - Downstream
- P18 - upstream
- P19 - view across transect L-R

7.97 3.96  
4.01

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project

Rte 114

Location of Crossing

Rte 114

Date of field assessment

12-14-2012

Bedford

"CS-1"

Bedford

Reference Reach 1: 0+75'

Starting bank (left/right)

Dist. from bank (ft.)	Dbf
1	2.28/1.64
2	2.42/1.78
3	2.53/1.89
4	2.53/1.93
5	2.56/1.90
6	2.38/1.71
7	2.23/1.50
8	2.10/1.40
9	2.05/1.34
10	1.92/1.19
11	1.91/1.16
12	1.76/1.00
13	1.50/0.74
14	1.33/0.53
15	1.13/0.30
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0'  
RB = EOW  
2.25/1.58

EOW-LB  
15.70'  
1.05/0.15'

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Avg Dbf=

Max water depth= 1.93

Ctr of structure@: NA:

Wbf = 15.70

Flood Prone Width= 31.75

3.86'  
2x =

10.30  
3.86

6.34

P4 - Across transect R-L  
P5 - Downstream  
P6 - upstream  
P7 - Across transect L-R

54/50

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Rte 114 Bedford

Location of Crossing Rte 114

Date of field assessment 12-14-201

Reference Reach 2: CS-2  
20+250'

Starting bank (left/right) RB-EDW=

Dist. from bank (ft.)	Dbf
1	2.68/1.90
2	2.74/2.00
3	2.75/2.06
4	2.74/2.07
5	2.65/2.00
6	2.52/1.89
7	2.27/1.66
8	2.09/1.49
9	1.85/1.24
10	1.67/1.05
11	1.54/0.90
12	1.62/0.95
13	1.79/1.09
14	1.90/1.16
15	1.91/1.10
16	1.92/1.09
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0'  
2.55/1.72

LB-EDW  
16.25'  
1.96/1.09

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Avg Dbf = 2.18

Max water depth = 2.07

Ctr of structure @: NA

Wbf = 1625

Flood Prone Width = 193

P8 - across transect R-L

P9 - Downstream

P10 - upstream

P11 - across transect L-R

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Rte 114

Location of Crossing Rte 114 - Bedford

Date of field assessment 12-14-2012

Bedford

Reference Reach 3:

Starting bank (left/right)

CS-3

Dist. from bank (ft.)	Dbf
1	0.88/Dry
2	1.73/0.72
3	2.00/1.05
4	2.05/1.15
5	2.17/1.33
6	2.21/1.40
7	2.24/1.41
8	2.00/1.19
9	1.81/1.02
10	1.65/0.86
11	1.75/0.94
12	1.44/0.56
13	2.58/1.71
14	3.01/2.08
15	3.85/2.88
16	1.90/0.88
17	3.28/2.20
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RB = 0.0  
 10.0/0.0  
 Eow = 1.20  
 1.18/0.15

LOG

Log

LB = 17.40'  
 3.38/2.30

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Avg Dbf = 2.22  
 Max water depth = 2.88  
 Ctr of structure @: NA  
 Wbf = 17.40  
 Flood Prone Width = 192

Scour along Left bank Due to flow being forced to left bank by Log/debris dam just upstream.

P12 - Across transect R-L  
 P13 - Downstream  
 P14 - upstream  
 P15 - Across transect L

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project: NHDOT Route 114 Culvert Replacement

Location of Crossing: Rt. 114, Bedford, NH

Date of field assessment: Fall, 2012

Reference Reach #: CS-4

Starting bank (left/right)

Dist. from bank (ft.)	Dbf
1	1.41/0.62
2	1.73/1.00
3	1.39/0.70
4	1.89/1.04
5	1.88/1.02
6	1.25/0.90
7	2.1/0.24
8	0.64/dry
9	0.48/dry
10	0.9/dry
11	0.88/dry
12	0.67/dry
13	0.58/dry
14	0.71/dry
15	0.66/dry
16	0.57/dry
17	0.69/dry
18	0.73/dry
19	0.79/dry
20	1.02/dry
21	1.09/dry
22	1.07/dry
23	0.87/dry
24	0.63/dry
25	0.51/dry
26	0.64/dry
27	0.66/dry
28	0.77/dry
29	0.86/dry
30	0.92/dry
31	0.98/dry
32	31.85 end

0+98 downstream of structure

Dbf 0 = 1.58/0.71

Boulder

11 11

cobble edged of water

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Avg Dbf = 0.97  
 Max water depth = 0.86"  
 Ctr of structure @: NA  
 Wbf = 31  
 Flood Prone Width = 48.75

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Bowman Brook Location of Crossing Beckford Rd Date of field assessment 12/14/12  
12/20/12

**Longitudinal Profile for Reference Reach** (length = 7-10 times bankfull width)

Starting at Reference 1 going towards Reference 2:

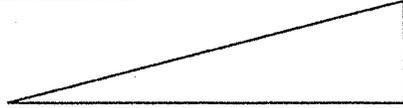
Shooting a pop level from at a height of: 22132 ft @ 0+150

Reading on survey rod at Ref 2: 22367 ft @ 0+425

A Difference of: 2.35 ft.

Distance between Ref 1 and Ref 2: 275 ft.

Slope at crossing: 0.009



Depth of Water at Thalweg: 0.8' @ 0+75

(Features: Riffle, Run, Pool, Step, Glide)

Features between Ref 1 and 2:	<u>Pool</u>	@ <u>0+408 → 0+450</u> ft
	<u>R. Flk</u>	@ <u>0+408 → 0+405</u> ft
	<u>Pool</u>	@ <u>0+405 → 0+380</u> ft
	<u>Run</u>	@ <u>0+380 → 0+270</u> ft
	<u>Pool</u>	@ <u>0+270 → 0+240</u> ft
	<u>R. Flk</u>	@ <u>0+240 → 0+180</u> ft

From Reference 2 going towards Reference 3:

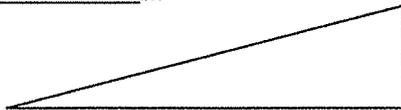
Shooting a pop level from at a height of: \_\_\_\_\_ ft.

Reading on survey rod at Ref 2: \_\_\_\_\_ ft.

A Difference of: \_\_\_\_\_ ft.

Distance between Ref 1 and Ref 2: \_\_\_\_\_ ft.

Slope at crossing: \_\_\_\_\_



Depth of Water at Thalweg: \_\_\_\_\_

(Features: Riffle, Run, Pool, Step, Glide)

Features between Ref 1 and 2:	_____	@ _____	ft
	_____	@ _____	ft
	_____	@ _____	ft
	_____	@ _____	ft
	_____	@ _____	ft
	_____	@ _____	ft

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Bowman Brook Location of Crossing Bedford 114 Date of field assessment 12/14/12  
12/20/12

**Office Calculations for (At Crossing Data):**

Entrenchment Ratio:  $W_{fpa}/W_{bf} =$  1.5

Width/Depth Ratio:  $W_{bf}/\text{Average Depth} =$  16.2

Sinuosity: stream length/valley length = 1.21

Channel Slope: 1.77'/200' in culvert = 0.89%

Channel Material: cobbles

Rosgen Classification: B3c

**Office Calculations for (Reference Reach Data):**

Entrenchment Ratio:  $W_{fpa}/W_{bf} =$  11.5 average

Width/Depth Ratio:  $W_{bf}/\text{Average Depth} =$  7.9 average

Sinuosity: stream length/valley length = 1.21

Channel Slope: 0.89%

Channel Material: Gravel

Rosgen Classification: E4 (entrenchment ratios criteria not met)

218.49  
 216.72  


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 1.77

Inlet section		Hoiz. Stat.	Reading	Elevation	
Bfl elev.=	221.6	1	0.85	220.75	
		2	0.65	220.95	
		3	1.27	220.33	
		4	1.17	220.43	
		5	1.51	220.09	
		6	1.4	220.2	
		7	1.47	220.13	
		8	1.41	220.19	
		9	1.8	219.8	
		10	1.55	220.05	
		11	1.39	220.21	
		12	1.5	220.1	
		13	1.52	220.08	
		14	1.72	219.88	
		15	0.86	220.74	
		16	1.08	220.52	
		17	1.4	220.2	
		18	1.86	219.74	
		19	1.16	220.44	
		20	1.15	220.45	
		21	0.17	221.43	1.280476
		22	0	221.6	
Watershed size:	11183 ac				
Max Bankfull Depth:	1.86				
Bankfull Width:	20.75				
Floodprone Width:	30.3				
Entrenchment ratio:	1.5				
Average bankfull depth:	1.28				
Width/Depth ratio:	16.2				
Sinuosity:	1.21	1.205			
Rosgen classification:	B4c				
Predominant substrate:	Gravel				
Approximate Water Elev.:	221.4				

---

outlet section		Hoiz. Stat.	Reading	Elevation	
Bfl elev.=	219.65	0	1.2	218.45	
		1	1.2	218.45	
		2	1.2	218.45	
		3	1.33	218.32	
		4	1.65	218	
		5	1.98	217.67	
		6	2.9	216.75	
		7	2.75	216.9	
		8	2.75	216.9	
		9	2.71	216.94	
		10	2.57	217.08	

11	2.31	217.34		
12	1.94	217.71		
13	1.6	218.05		
14	1.39	218.26		
14.75	0.67	218.98	30.15	1.88
15	0	219.65		

Watershed size: 11183 ac  
 Max Bankfull Depth: 2.9  
 Bankfull Width: 15.25  
 Floodprone Width: 28.55  
 Entrenchment ratio: 1.9  
 Average bankfull depth: 1.88  
 Width/Depth ratio: 8.1  
 Sinuosity: 1.21  
 Rosgen classification: B4c best match; w/d ratio not within criteria  
 Predominant substrate: Cobble  
 Approximate Water Elev.: 219.54

Reference upstream CS-1 at 0+75 above inlet

		Hoiz. Stat.	Reading	Elevation	
Bfl elev.=	221.98	0	2.25	219.73	
		1	2.28	219.7	
		2	2.42	219.56	
		3	2.53	219.45	
		4	2.53	219.45	
		5	2.56	219.42	
		6	2.38	219.6	
		7	2.23	219.75	
		8	2.1	219.88	
		9	2.05	219.93	
		10	1.92	220.06	
		11	1.91	220.07	
		12	1.76	220.22	
		13	1.5	220.48	
		14	1.33	220.65	
		15	1.13	220.85	
		15.7	1.05	220.93	2.00

Watershed size: 11183 ac  
 Max Bankfull Depth: 2.56  
 Bankfull Width: 15.7  
 Floodprone Width: 31.75  
 Entrenchment ratio: 2.0  
 Average bankfull depth: 2  
 Width/Depth ratio: 7.9  
 Sinuosity: 1.21  
 Rosgen classification: B4c best match; w/d ratio not within criteria  
 Predominant substrate: Gravel

Approximate Water Elev.: 220.34

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Reference upstream CS-2 at 0+250 above inlet

Bfl elev.=	224.95	Hoiz. Stat.	Reading	Elevation		
			0	2.55	222.4	
			1	2.68	222.27	
			2	2.74	222.21	
			3	2.75	222.2	
			4	2.74	222.21	
			5	2.65	222.3	
			6	2.52	222.43	
			7	2.27	222.68	
			8	2.09	222.86	
			9	1.85	223.1	
			10	1.67	223.28	
			11	1.54	223.41	
			12	1.62	223.33	
			13	1.79	223.16	
			14	1.9	223.05	
			15	1.91	223.04	
			16	1.92	223.03	39.15
		16.25	1.96	222.99		2.175
Watershed size:	11183	ac				
Max Bankfull Depth:	2.75					
Bankfull Width:	16.25					
Floodprone Width:	193					
Entrenchment ratio:	11.9					
Average bankfull depth:	2.18					
Width/Depth ratio:	7.5					
Sinuosity:	1.21					
Rosgen classification:	E4	best match; sinuosity does not meet criteria				
Predominant substrate:	Gravel					
Approximate Water Elev.:	223.3					

---

Reference upstream CS-3 @ 0+400 above inlet

Bfl elev.=	225.6	Hoiz. Stat.	Reading	Elevation
			0	0
			1	0.88
			2	1.73
			3	2
			4	2.05
			5	2.17
			6	2.21
			7	2.24
			8	2
			9	1.81
			10	1.65

11	1.75	223.85		
12	1.44	224.16		
13	2.58	223.02		
14	3.01	222.59		
15	3.85	221.75		
16	1.9	223.7		
17	3.28	222.32	39.93	2.101579
17.4	3.38	222.22		
17.5	0	225.6		

Watershed size: 11183 ac  
 Max Bankfull Depth: 3.85  
 Bankfull Width: 17.4  
 Floodprone Width: 192  
 Entrenchment ratio: 11.0  
 Average bankfull depth: 2.1  
 Width/Depth ratio: 8.3  
 Sinuosity: 1.21  
 Rosgen classification: E4 best match; sinuosity does not meet criteria  
 Predominant substrate: Gravel  
 Approximate Water Elev.: 224.6

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CS-4 0+98 feet downstream of outlet

	Hoiz. Stat.	Reading	Elevation
Bfl elev.=	217.24	0	215.66
		1	215.83
		2	215.51
		3	215.86
		4	215.35
		5	215.36
		6	215.49
		7	215.14
		8	216.6
		9	216.76
		10	216.44
		11	216.36
		12	216.57
		13	216.66
		14	216.53
		15	216.58
		16	216.67
		17	216.55
		18	216.51
		19	216.45
		20	216.16
		21	216.15
		22	216.17
		23	216.37

24	0.63	216.61
25	0.51	216.73
26	0.64	216.6
27	0.66	216.58
28	0.77	216.47
29	0.86	216.38
30	0.92	216.32
31	0.98	216.26
31.85	0	217.24

Watershed size: 11183  
 Max Bankfull Depth: 2.1  
 Bankfull Width: 31  
 Floodprone Width: 48.75  
 Entrenchment ratio: 1.6  
 Average bankfull depth: 1  
 Width/Depth ratio: 14.8  
 Sinuosity: 1.21  
 Rosgen classification: B3c  
 Predominant substrate: Cobble  
 Approximate Water Elev.: 216.2

Feature	Reading	Elevation	X	Y
HOM above Bfl 221.37	-10.59	231.96		
0+35	-11.51	220.45 Plot	35	220.45
0+50	-12.13	219.83 Plot	50	219.83
0+75	-12.99	218.97 Plot	75	218.97
0+100	-12.91	219.05 Plot	100	219.05
0+115	-11.96	220 Plot	115	220
0+150	-10.64	221.32 Plot	150	221.32
0+175	-13.43	218.53 Plot	175	218.53
0+187	-11.47	220.49 Plot	187	220.49
0+207	-10.39	221.57 Plot	207	221.57
Move new HOM		232.21	225	221.82
0+225	-10.39	221.82 Plot	250	220.58
Move new HOM		232.97	275	220.99
0+250	-12.39	220.58 Plot	300	222.03
New HOM		234.46	325	221.29
0+275	-13.47	220.99 Plot	350	220.67
0+300	-12.43	222.03 Plot	375	220.03
0+325	-13.17	221.29 Plot	425	223.67
0+350	-13.79	220.67 Plot	450	223.72
0+375	-14.43	220.03 Plot	475	224.63
New HOM		237.85		
0+425	-11.29	226.56 Plot		
0+450	-11.24	226.61 Plot		
0+475	-10.33	227.52 Plot		

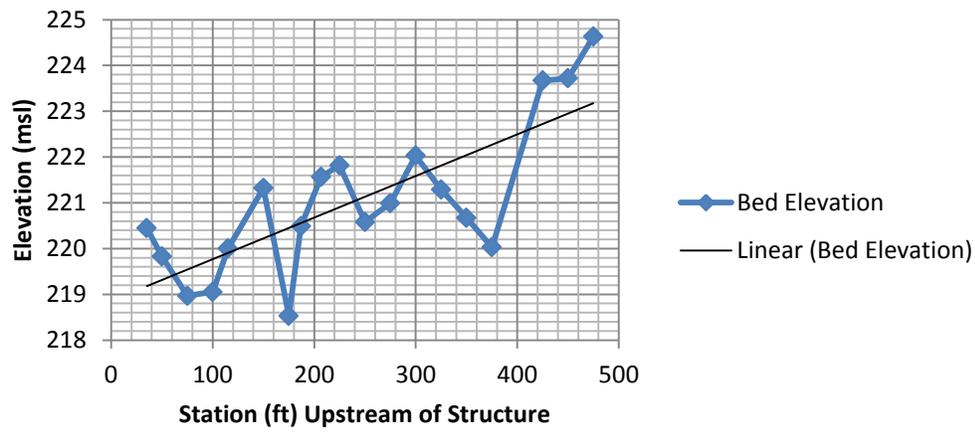
0.0088 gradient from 0+100 to 0+460

**Downstream**

Height of machine	-7.97	227.65	219.68	
Culvert outlet invert		216.71		
-0+20	-9.91	217.74		
-0+24	-9.35	218.3 *		0.029231 gradient from -0+24 to -0+102
-0+38	-10.78	216.87		
-0+50	-11.9	215.75		
-0+56	-11.25	216.4		
-0+73	-11.59	216.06		
New HOM		224.03	224.03	
-0+85	-8.43	215.6		
0+102	-7.01	217.02 *		

\*= used for gradient calculation

## Bed Elevation





New Hampshire Natural Heritage Bureau  
NHB DataCheck Results Letter

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**To:** Rebecca Martin, NH DOT  
7 Hazen Drive  
PO Box 483  
Concord, NH 03302

**From:** NH Natural Heritage Bureau

**Date:** 12/10/2020 (valid for one year from this date)

**Re:** Review by NH Natural Heritage Bureau of request submitted 12/8/2020

**NHB File ID:** NHB20-3620

**Applicant:** Rebecca Martin

**Location:** Bedford  
Culvert carrying Bowman Brook beneath NH 114

**Project Description:** The project proposes to rehabilitate the culvert carrying Bowman Brook under 114, just north of the intersection with New Boston Rd.

The NH Natural Heritage database has been checked by staff of the NH Natural Heritage Bureau and/or the NH Nongame and Endangered Species Program for records of rare species and exemplary natural communities near the area mapped below. The species considered include those listed as Threatened or Endangered by either the state of New Hampshire or the federal government.

It was determined that, although there was a NHB record (e.g., rare wildlife, plant, and/or natural community) present in the vicinity, we do not expect that it will be impacted by the proposed project. This determination was made based on the project information submitted via the NHB Datacheck Tool on 12/8/2020, and cannot be used for any other project.

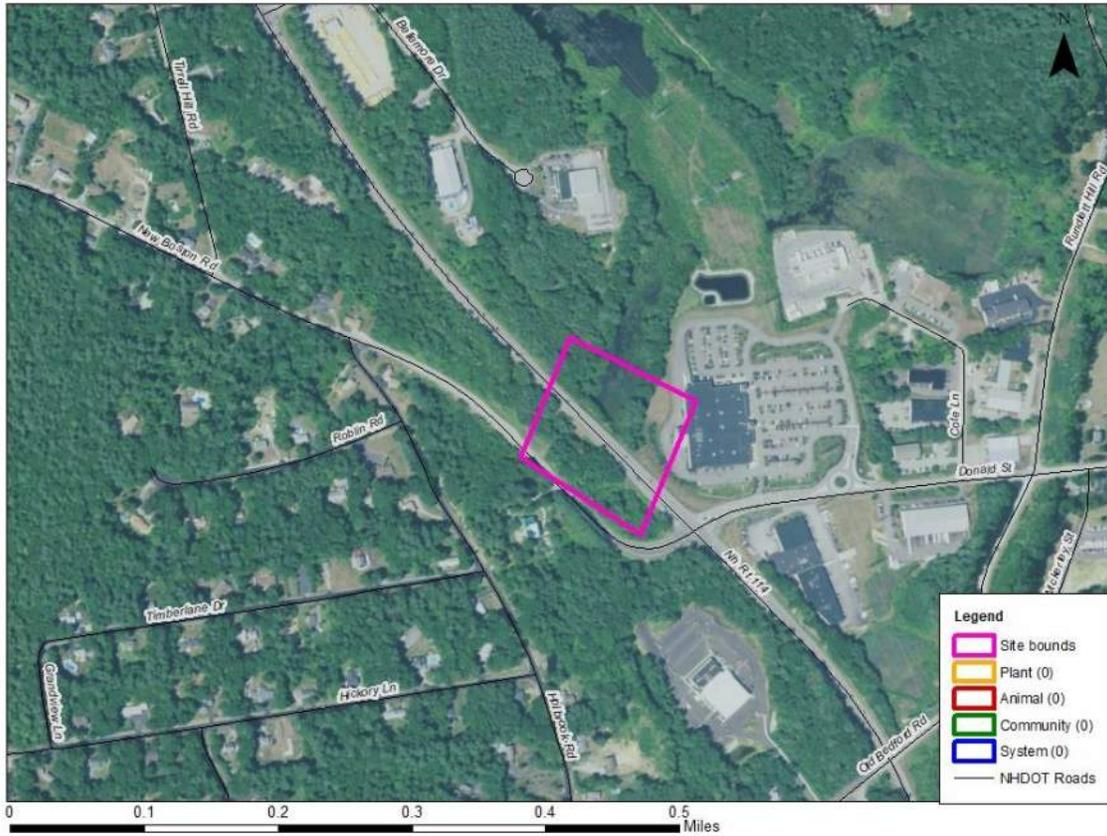


# New Hampshire Natural Heritage Bureau

## NHB DataCheck Results Letter

### MAP OF PROJECT BOUNDARIES FOR: NHB20-3620

#### NHB20-3620



## Martin, Rebecca

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**From:** Magee, John  
**Sent:** Wednesday, August 4, 2021 10:26 AM  
**To:** Martin, Rebecca  
**Cc:** Carpenter, Matthew  
**Subject:** RE: Bedford 43138 RE:42268 Bedford - Low flow Depth & Velocity for F&G Coordination

Hi Rebecca. I have included Carol Henderson on this email. My understanding is that the official recommendation from F&G has not TOY restriction, and Carol can provide more detail here.

Looking at the landscape and open water there, I suspect there are no wild brook trout close to this crossing.

I have found it very helpful to know the dates of photos of crossings as that allows me and others to look up the streamflow data for nearby USGS gages, which helps us better understand how the proposal may affect AOP. For example, photos taken at a relatively high flow may show a culvert that has no outlet perch, but it could be perched at lower flows and precluded AOP. If BOE could include dates for photos, that would be helpful. I have set my camera to date and timestamp in the photo.

Thank you,

John

John Magee, M.S., Certified Fisheries Professional  
Fisheries Habitat Research and Management Programs Coordinator  
New Hampshire Fish and Game Department  
11 Hazen Drive, Concord, NH 03301  
Phone 603-271-2744  
Fax 603-271-5829

Did you know? New Hampshire Fish and Game protects, conserves and manages more than 500 species of wildlife, including 63 mammals, 18 reptiles, 22 amphibians, 313 birds and 122 kinds of fish as well as thousands of invertebrates!

---

**From:** Martin, Rebecca <Rebecca.A.Martin@dot.nh.gov>  
**Sent:** Thursday, July 29, 2021 2:30 PM  
**To:** Magee, John <john.a.magee@wildlife.nh.gov>  
**Cc:** Carpenter, Matthew <mathew.a.carpenter@wildlife.nh.gov>  
**Subject:** Bedford 43138 RE:42268 Bedford - Low flow Depth & Velocity for F&G Coordination

Hello John,

I hope this message finds you well.

I am the Environmental Manager for a project a few crossings upstream of the Bedford 42268 crossing that we corresponded about last year. No species showed up on my NHB list. The project proposes to rehabilitate an existing culvert that carries Bowman Brook under NH Route 114 just north of the intersection of NH Route 114, Donald Street and New Boston Road in Bedford. The existing pipe is 72 inches in diameter and 120 foot long. Upstream of the crossing is a ponded wet area (photos attached). The existing pipe was constructed in 1964, is corrugated metal and has significant corrosion along the bottom and lower sides. There is a significant amount of fill over the culvert, estimated at

around 18 feet from the culvert invert to the edge of the NH Route 114 pavement. Bowman Brook flows towards the south east, originating in the Walnut Hill area and eventually discharging into the Merrimack River. There are similarly sized culverts located along Bowman Brook. The preferred treatment is rehabilitation by sliplining. The cured in place liner is the preferred liner type because it is the only liner type explored that would slightly increase the capacity of the pipe. The proposed design would maintain existing culvert capacity and minimize any increase in outlet velocity. At this point more than a very slight outlet velocity increase seems unlikely, but if there will be an increase, some new stone may be placed at the outlet for scour protection. The project also proposes to repair the culvert's stone headwalls by resetting loose stones and mortar patching.

Downstream of the Bedford 42268 project area there was P/A data from 2009: Present- Blacknose dace, Creek chub, Common shiner, Common white sucker, Eastern brook trout, Slimy sculpin.

For the Bedford 42268 project you had recommended a TOY restriction (no work in September or October) to avoid impacts to brook trout. Would you recommend the same at this location? Please let me know if any additional information might be helpful.

Thank you,  
Rebecca

Rebecca Martin  
Senior Environmental Manager  
NH DOT Bureau of Environment  
7 Hazen Drive  
Concord, NH 03302  
(603)271-6781  
[Rebecca.A.Martin@dot.nh.gov](mailto:Rebecca.A.Martin@dot.nh.gov)

---

**From:** Magee, John <[john.magee@wildlife.nh.gov](mailto:john.magee@wildlife.nh.gov)>  
**Sent:** Thursday, February 13, 2020 12:15 PM  
**To:** Carucci, Christopher <[Christopher.Carucci@dot.nh.gov](mailto:Christopher.Carucci@dot.nh.gov)>  
**Cc:** Carpenter, Matthew <[Matthew.Carpenter@wildlife.nh.gov](mailto:Matthew.Carpenter@wildlife.nh.gov)>; Large, Sarah <[Sarah.Large@dot.nh.gov](mailto:Sarah.Large@dot.nh.gov)>; Martin, Rebecca <[Rebecca.Martin@dot.nh.gov](mailto:Rebecca.Martin@dot.nh.gov)>; Mallette, Timothy <[Timothy.Mallette@dot.nh.gov](mailto:Timothy.Mallette@dot.nh.gov)>  
**Subject:** RE: 42268 Bedford - Low flow Depth & Velocity for F&G Coordination

Yes, I think that would be accurate to say.

John Magee, M.S., Certified Fisheries Professional  
Past President, Northeastern Division of the American Fisheries Society  
Fisheries Habitat Research and Management Programs Coordinator  
New Hampshire Fish and Game Department  
11 Hazen Drive, Concord, NH 03301  
Phone 603-271-2744  
Fax 603-271-5829

Did you know? New Hampshire Fish and Game protects, conserves and manages more than 500 species of wildlife, including 63 mammals, 18 reptiles, 22 amphibians, 313 birds and 122 kinds of fish as well as thousands of invertebrates!

---

**From:** Carucci, Christopher  
**Sent:** Thursday, February 13, 2020 12:06 PM

**To:** Magee, John  
**Cc:** Carpenter, Matthew ; Large, Sarah ; Martin, Rebecca ; Mallette, Timothy  
**Subject:** RE: 42268 Bedford - Low flow Depth & Velocity for F&G Coordination

Sounds like we could say that the existing condition is not passable in the upstream direction for most fish species. Could we say that the proposed liner would not significantly change fish passage conditions?

---

**From:** Magee, John <[john.magee@wildlife.nh.gov](mailto:john.magee@wildlife.nh.gov)>  
**Sent:** Thursday, February 13, 2020 11:43 AM  
**To:** Carucci, Christopher <[Christopher.Carucci@dot.nh.gov](mailto:Christopher.Carucci@dot.nh.gov)>  
**Cc:** Carpenter, Matthew <[Matthew.Carpenter@wildlife.nh.gov](mailto:Matthew.Carpenter@wildlife.nh.gov)>; Large, Sarah <[Sarah.Large@dot.nh.gov](mailto:Sarah.Large@dot.nh.gov)>; Martin, Rebecca <[Rebecca.Martin@dot.nh.gov](mailto:Rebecca.Martin@dot.nh.gov)>; Mallette, Timothy <[Timothy.Mallette@dot.nh.gov](mailto:Timothy.Mallette@dot.nh.gov)>  
**Subject:** RE: 42268 Bedford - Low flow Depth & Velocity for F&G Coordination

Thanks for checking Chris. I didn't realize there such a difference in Manning's n for smooth vs corrugated.

Overall, the depths look good, but the velocities for that length of pipe are probably limiting/precluding fish passage there. Sounds like this is the only option. Re: possibly research studies on fish passage at culverts, I will mention this one to the Plymouth State University folks when F&G meets with them in a few weeks, but it's farther from PSU than the one in Bethlehem.

John

John Magee, M.S., Certified Fisheries Professional  
Past President, Northeastern Division of the American Fisheries Society  
Fisheries Habitat Research and Management Programs Coordinator  
New Hampshire Fish and Game Department  
11 Hazen Drive, Concord, NH 03301  
Phone 603-271-2744  
Fax 603-271-5829

Did you know? New Hampshire Fish and Game protects, conserves and manages more than 500 species of wildlife, including 63 mammals, 18 reptiles, 22 amphibians, 313 birds and 122 kinds of fish as well as thousands of invertebrates!

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**From:** Carucci, Christopher <[Christopher.Carucci@dot.nh.gov](mailto:Christopher.Carucci@dot.nh.gov)>  
**Sent:** Thursday, February 13, 2020 11:30 AM  
**To:** Magee, John <[john.magee@wildlife.nh.gov](mailto:john.magee@wildlife.nh.gov)>  
**Cc:** Carpenter, Matthew <[Matthew.Carpenter@wildlife.nh.gov](mailto:Matthew.Carpenter@wildlife.nh.gov)>; Large, Sarah <[Sarah.Large@dot.nh.gov](mailto:Sarah.Large@dot.nh.gov)>; Martin, Rebecca <[Rebecca.Martin@dot.nh.gov](mailto:Rebecca.Martin@dot.nh.gov)>; Mallette, Timothy <[Timothy.Mallette@dot.nh.gov](mailto:Timothy.Mallette@dot.nh.gov)>  
**Subject:** RE: 42268 Bedford - Low flow Depth & Velocity for F&G Coordination

I double checked and velocities are as reported by HY-8.  
The increase is due to a more efficient (smoother) corrugated metal pipe liner Mannings n = 0.014 vs existing structural plate pipe n = 0.034.

Actual slope is 1.07%, so drop is 6.76' over the 632' length.

The 1 cfs number is the minimum HY-8 will run. Based on the size of the drainage area, large upstream storage area, and several field trips,  
I think typical low flow is closer to 9" deep (10 cfs), so existing velocity would be around 4.2 ft/s and increasing to about 6 ft/s with the liner.

We don't have many options for this crossing. Replacement is not practical due to height of fill and we are limited to matching FEMA's regulatory 100 year flood elevation. The smoother corrugated metal liner increases capacity, offsetting the reduced diameter and not causing an increase in the 100 year headwater elevation.

---

**From:** Martin, Rebecca <[Rebecca.Martin@dot.nh.gov](mailto:Rebecca.Martin@dot.nh.gov)>  
**Sent:** Thursday, February 13, 2020 11:08 AM  
**To:** Carucci, Christopher <[Christopher.Carucci@dot.nh.gov](mailto:Christopher.Carucci@dot.nh.gov)>  
**Cc:** Carpenter, Matthew <[Matthew.Carpenter@wildlife.nh.gov](mailto:Matthew.Carpenter@wildlife.nh.gov)>; Magee, John <[john.magee@wildlife.nh.gov](mailto:john.magee@wildlife.nh.gov)>; Large, Sarah <[Sarah.Large@dot.nh.gov](mailto:Sarah.Large@dot.nh.gov)>  
**Subject:** FW: 42268 Bedford - Low flow Depth & Velocity for F&G Coordination

Hi Chris,

Right after you left I received this message (see below) from John. As you know, I will be out of the Office on vacation from tomorrow through Wednesday. Could you please respond directly to John's questions?

John, thanks so much for your help with this, I believe Chris will be in contact with you.

Thank you,  
Rebecca

---

**From:** Magee, John <[john.magee@wildlife.nh.gov](mailto:john.magee@wildlife.nh.gov)>  
**Sent:** Thursday, February 13, 2020 11:04 AM  
**To:** Martin, Rebecca <[Rebecca.Martin@dot.nh.gov](mailto:Rebecca.Martin@dot.nh.gov)>  
**Cc:** Carpenter, Matthew <[Matthew.Carpenter@wildlife.nh.gov](mailto:Matthew.Carpenter@wildlife.nh.gov)>  
**Subject:** RE: 42268 Bedford - Low flow Depth & Velocity for F&G Coordination

Hi Rebecca. The shallowest water depth (0.19', at 1cfs) is OK, but the velocity at that flow is predicted to be 3.6ft/s if I am reading that correctly. I think the velocity and length would not be passable by fish. Is that 3.6ft/s correct? I ask only because that seems very fast for only 1cfs. If the culvert is ~1% slope and is 632 feet long, then the inlet is 6 ft higher than the outlet?

Thanks,

John

John Magee, M.S., Certified Fisheries Professional  
Past President, Northeastern Division of the American Fisheries Society  
Fisheries Habitat Research and Management Programs Coordinator  
New Hampshire Fish and Game Department  
11 Hazen Drive, Concord, NH 03301  
Phone 603-271-2744  
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Did you know? New Hampshire Fish and Game protects, conserves and manages more than 500 species of wildlife, including 63 mammals, 18 reptiles, 22 amphibians, 313 birds and 122 kinds of fish as well as thousands of invertebrates!

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**From:** Martin, Rebecca <[Rebecca.Martin@dot.nh.gov](mailto:Rebecca.Martin@dot.nh.gov)>  
**Sent:** Thursday, February 6, 2020 8:32 AM  
**To:** Magee, John <[john.magee@wildlife.nh.gov](mailto:john.magee@wildlife.nh.gov)>  
**Cc:** Carpenter, Matthew <[Matthew.Carpenter@wildlife.nh.gov](mailto:Matthew.Carpenter@wildlife.nh.gov)>  
**Subject:** FW: 42268 Bedford - Low flow Depth & Velocity for F&G Coordination

Hi John,

There has been a change to the proposed project in Bedford that I had emailed with you about last year (email attached). The subject culvert carries Bowman Brook under both Route 101 and Boynton Street. When we communicated last, the plan was to daylight the stream between the two roadways. However, when the design team visited the project area, they found that the slopes would be too steep, so now they are hoping to slipline the pipe. The slipline would reduce the capacity of the pipe (90" pipe with a proposed 84" corrugated metal liner) and the flow of water in the pipe would be increased because of the type of corrugation proposed. Unfortunately, the design team tells me that they could not put measures in to slow the water down because the pipe is inlet controlled and water would impound at the inlet of the current pipe (90") at the 100-year storm, so that could potentially be exacerbated with the proposed slipline treatment. There are additional details below. Would you expect that fish could pass through the existing pipe? You had recommended not doing the work in September or October, are there any other conservation measures you would suggest?

Thank you,  
Rebecca

---

**From:** Carucci, Christopher <[Christopher.Carucci@dot.nh.gov](mailto:Christopher.Carucci@dot.nh.gov)>  
**Sent:** Monday, February 3, 2020 4:39 PM  
**To:** Martin, Rebecca <[Rebecca.Martin@dot.nh.gov](mailto:Rebecca.Martin@dot.nh.gov)>  
**Cc:** Mallette, Timothy <[Timothy.Mallette@dot.nh.gov](mailto:Timothy.Mallette@dot.nh.gov)>  
**Subject:** 42268 Bedford - Low flow Depth & Velocity for F&G Coordination

Photos from 5/24/2018 attached.

Existing: 90" cmp, 632' long (including the mitered ends), culvert slope 1.07%  
Drainage area = 3.94 Sq miles from Streamstats  
Proposed: 84" cmp liner, 620' long (replace mitered inlet with headwall), invert will be about 2" higher than existing

Streamstats 2 year -7 day low flow = 0.14 cfs (drought condition)

Note that FHWA's HY-8 culvert program has a minimum flowrate of 1 cfs, so depth and velocity are not modelled for the drought condition.

HY-8 results for flows up to Streamstats 2 year storm = 132 cfs

	Existing	Proposed	Existing	Proposed
	90" cmp	84" Liner	90" cmp	84" Liner
	Flowrate	Minimum	Minimum	Maximum
	Q (cfs)	Depth	Depth	Velocity

1	0.24'	0.19'	2.4 ft/s	3.6 ft/s
5	0.54'	0.43'	3.5	4.9
10	0.77'	0.60'	4.2	6.0
25	1.23'	0.94'	5.2	7.9
50	1.76'	1.31'	6.3	9.6

100 2.51' 1.86' 7.7 11.4  
132 2.90' 2.14' 8.4 12.7



## United States Department of the Interior



FISH AND WILDLIFE SERVICE  
New England Ecological Services Field Office  
70 Commercial Street, Suite 300  
Concord, NH 03301-5094  
Phone: (603) 223-2541 Fax: (603) 223-0104  
<http://www.fws.gov/newengland>

In Reply Refer To:  
Consultation Code: 05E1NE00-2021-SLI-0700  
Event Code: 05E1NE00-2022-E-01270  
Project Name: Bedford 43138

November 03, 2021

Subject: Updated list of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

### To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan ([http://www.fws.gov/windenergy/eagle\\_guidance.html](http://www.fws.gov/windenergy/eagle_guidance.html)). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at:

<http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>;

<http://www.towerkill.com>; and

<http://>

[www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html](http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html).

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
-

## Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

**New England Ecological Services Field Office**

70 Commercial Street, Suite 300

Concord, NH 03301-5094

(603) 223-2541

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## Project Summary

Consultation Code: 05E1NE00-2021-SLI-0700

Event Code: Some(05E1NE00-2022-E-01270)

Project Name: Bedford 43138

Project Type: TRANSPORTATION

Project Description: The project proposes to rehabilitate the culvert carrying Bowman Brook under 114, just north of the intersection with New Boston Rd. The existing pipe is a corrugated metal pipe that is 72" in diameter and was constructed in the 1960s. The preferred treatment is to slipline the pipe, most likely with a cured in-place liner.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@42.96983248953259,-71.51009474067402,14z>



Counties: Hillsborough County, New Hampshire

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## Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries<sup>1</sup>, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

- 
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

### Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: <a href="https://ecos.fws.gov/ecp/species/9045">https://ecos.fws.gov/ecp/species/9045</a>	Threatened

### Insects

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> No critical habitat has been designated for this species. Species profile: <a href="https://ecos.fws.gov/ecp/species/9743">https://ecos.fws.gov/ecp/species/9743</a>	Candidate

### Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

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## Martin, Rebecca

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**From:** vonOettingen, Susi <susi\_vonoettingen@fws.gov>  
**Sent:** Monday, December 14, 2020 7:10 AM  
**To:** Martin, Rebecca  
**Subject:** Re: [EXTERNAL] NHDOT Project Bedford 43138 : NHB review: NHB20-3620

**EXTERNAL: Do not open attachments or click on links unless you recognize and trust the sender.**

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Hi Rebecca,

No worries, definitely not small whorled pogonia habitat. It needs larger blocks of forested habitat. I have never seen the plant in a developed area, although it may occur at the edge of forest near roadways. The species needs periodic disturbances in a forested habitat to create canopy openings in order to maintain its population, that's why it needs large forested tracts. I don't believe I've seen it in heavily fragmented habitat.

Susi

---

**From:** Martin, Rebecca <Rebecca.A.Martin@dot.nh.gov>  
**Sent:** Friday, December 11, 2020 1:49 PM  
**To:** vonOettingen, Susi <susi\_vonoettingen@fws.gov>  
**Subject:** [EXTERNAL] NHDOT Project Bedford 43138 : NHB review: NHB20-3620

**This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.**

Hi Susi,

I was recently assigned a new project in Bedford that is proposing to slipline an existing 72" diameter corrugated metal pipe under NH Route 114. The project engineer is anticipating a relatively small impact area at the inlet and the outlet for the slipline treatment (50' by 50' at each). There will be access with equipment at both the inlet and the outlet (as shown in yellow on the attached BOE Initial Request). The small whorled pogonia and the NLEB came up on the IPaC list. I plan to use the FHWA Programmatic for the NLEB review. I am writing to ask if you would recommend I check the area for small whorled pogonia next year? I checked with Amy Lamb and the nearest record in the NHB db is 4.9 miles away. Most of the project area is regularly maintained, rip rapped (on the inlet access area) or covered with invasives (knotweed), but there is a small area at the outlet which has reforested into an immature mixed forest on a bit of a slope and near the stream (Bowman Brook). I was very late in the season, but the understory was pretty open. I would appreciate hearing your thoughts. I have more photos too, if that would help.

Happy Holidays!  
Rebecca

Rebecca Martin  
Senior Environmental Manager  
NH DOT Bureau of Environment  
7 Hazen Drive

Concord, NH 03302  
(603)271-6781  
[Rebecca.A.Martin@dot.nh.gov](mailto:Rebecca.A.Martin@dot.nh.gov)

---

**From:** Lamb, Amy <[Amy.E.Lamb@dncr.nh.gov](mailto:Amy.E.Lamb@dncr.nh.gov)>  
**Sent:** Friday, December 11, 2020 12:44 PM  
**To:** Martin, Rebecca <[Rebecca.A.Martin@dot.nh.gov](mailto:Rebecca.A.Martin@dot.nh.gov)>  
**Subject:** RE: NHB review: NHB20-3620

Hi Rebecca,

The nearest SWP site is in Manchester, 4.9 miles away. The next closest that we have documented is in Weare, 11.3 miles away.

Have a nice weekend,  
Amy

---

**From:** Martin, Rebecca <[Rebecca.A.Martin@dot.nh.gov](mailto:Rebecca.A.Martin@dot.nh.gov)>  
**Sent:** Friday, December 11, 2020 8:08 AM  
**To:** Lamb, Amy <[Amy.E.Lamb@dncr.nh.gov](mailto:Amy.E.Lamb@dncr.nh.gov)>  
**Subject:** RE: NHB review: NHB20-3620

Good morning Amy,

I put the project into IPaC this morning and the small whorled pogonia came up in their db. If you have time, could you please let me know where the nearest record in the NHB db is located?

Thank you,  
Rebecca

---

**From:** Lamb, Amy <[Amy.E.Lamb@dncr.nh.gov](mailto:Amy.E.Lamb@dncr.nh.gov)>  
**Sent:** Thursday, December 10, 2020 5:44 PM  
**To:** Martin, Rebecca <[Rebecca.A.Martin@dot.nh.gov](mailto:Rebecca.A.Martin@dot.nh.gov)>  
**Subject:** NHB review: NHB20-3620

Attached, please find the review we have completed. Contact me if you have any further questions or problems with the attachments.

Best,

Amy  
Amy Lamb  
Ecological Information Specialist  
NH Natural Heritage Bureau  
DNCR - Forests & Lands  
172 Pembroke Rd  
Concord, NH 03301  
603-271-2834



## United States Department of the Interior



FISH AND WILDLIFE SERVICE  
New England Ecological Services Field Office  
70 Commercial Street, Suite 300  
Concord, NH 03301-5094  
Phone: (603) 223-2541 Fax: (603) 223-0104  
<http://www.fws.gov/newengland>

IPaC Record Locator: 726-107314563

November 18, 2021

Subject: Consistency letter for the 'Bedford 43138' project (no current TAILS record) under the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request to verify that the **Bedford 43138** (Proposed Action) may rely on the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 *et seq.*).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action is within the scope and adheres to the criteria of the PBO, including the adoption of applicable avoidance and minimization measures, and may affect, and is likely to adversely affect the endangered Indiana bat (*Myotis sodalis*) and/or the threatened Northern long-eared bat (*Myotis septentrionalis*). Consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) is required.

**For Proposed Actions that include bridge/structure removal, replacement, and/or maintenance activities:** If your initial bridge/structure assessments failed to detect Indiana bats, but you later detect bats during construction, please submit the Post Assessment Discovery of Bats at Bridge/Structure Form (User Guide Appendix E) to this Service Office. In these instances, potential incidental take of Indiana bats may be exempted provided that the take is reported to the Service.

If the Proposed Action may affect any other federally-listed or proposed species and/or designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act

may also be required. In either of these circumstances, please advise the lead Federal action agency accordingly.

The following species may occur in your project area and **are not** covered by this determination:

- Monarch Butterfly *Danaus plexippus* Candidate
-

## **Project Description**

The following project name and description was collected in IPaC as part of the endangered species review process.

### ***Name***

Bedford 43138

### ***Description***

The project proposes to rehabilitate the culvert carrying Bowman Brook under 114, just north of the intersection with New Boston Rd. The existing pipe is a corrugated metal pipe that is 72" in diameter and was constructed in the 1960s. The preferred treatment is to slipline the pipe, most likely with a cured in-place liner.

---

## Determination Key Result

Based on your answers provided, this project is likely to adversely affect the endangered Indiana bat and/or the threatened Northern long-eared bat. Therefore, consultation with the U.S. Fish and Wildlife Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 *et seq.*) is required. However, also based on your answers provided, this project may rely on the conclusion and Incidental Take Statement provided in the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

## Qualification Interview

1. Is the project within the range of the Indiana bat<sup>[1]</sup>?

[1] See [Indiana bat species profile](#)

**Automatically answered**

No

2. Is the project within the range of the Northern long-eared bat<sup>[1]</sup>?

[1] See [Northern long-eared bat species profile](#)

**Automatically answered**

Yes

3. Which Federal Agency is the lead for the action?

A) *Federal Highway Administration (FHWA)*

4. Are *all* project activities limited to non-construction<sup>[1]</sup> activities only? (examples of non-construction activities include: bridge/abandoned structure assessments, surveys, planning and technical studies, property inspections, and property sales)

[1] Construction refers to activities involving ground disturbance, percussive noise, and/or lighting.

No

5. Does the project include *any* activities that are **greater than** 300 feet from existing road/rail surfaces<sup>[1]</sup>?

[1] Road surface is defined as the actively used [e.g. motorized vehicles] driving surface and shoulders [may be pavement, gravel, etc.] and rail surface is defined as the edge of the actively used rail ballast.

No

6. Does the project include *any* activities **within** 0.5 miles of a known Indiana bat and/or NLEB hibernaculum<sup>[1]</sup>?

[1] For the purpose of this consultation, a hibernaculum is a site, most often a cave or mine, where bats hibernate during the winter (see suitable habitat), but could also include bridges and structures if bats are found to be hibernating there during the winter.

No

7. Is the project located **within** a karst area?

No

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8. Is there *any* suitable<sup>[1]</sup> summer habitat for Indiana Bat or NLEB **within** the project action area<sup>[2]</sup>? (includes any trees suitable for maternity, roosting, foraging, or travelling habitat)

[1] See the Service's [summer survey guidance](#) for our current definitions of suitable habitat.

[2] The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR Section 402.02). Further clarification is provided by the [national consultation FAQs](#).

*Yes*

9. Will the project remove *any* suitable summer habitat<sup>[1]</sup> and/or remove/trim any existing trees **within** suitable summer habitat?

[1] See the Service's [summer survey guidance](#) for our current definitions of suitable habitat.

*Yes*

10. Will the project clear more than 20 acres of suitable habitat per 5-mile section of road/rail?  
*No*

11. Have presence/probable absence (P/A) summer surveys<sup>[1][2]</sup> been conducted<sup>[3][4]</sup> **within** the suitable habitat located within your project action area?

[1] See the Service's [summer survey guidance](#) for our current definitions of suitable habitat.

[2] Presence/probable absence summer surveys conducted within the fall swarming/spring emergence home range of a documented Indiana bat hibernaculum (contact local Service Field Office for appropriate distance from hibernacula) that result in a negative finding requires additional consultation with the local Service Field Office to determine if clearing of forested habitat is appropriate and/or if seasonal clearing restrictions are needed to avoid and minimize potential adverse effects on fall swarming and spring emerging Indiana bats.

[3] For projects within the range of either the Indiana bat or NLEB in which suitable habitat is present, and no bat surveys have been conducted, the transportation agency will assume presence of the appropriate species. This assumption of presence should be based upon the presence of suitable habitat and the capability of bats to occupy it because of their mobility.

[4] Negative presence/probable absence survey results obtained using the [summer survey guidance](#) are valid for a minimum of two years from the completion of the survey unless new information (e.g., other nearby surveys) suggest otherwise.

*No*

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12. Does the project include activities **within documented NLEB habitat**<sup>[1][2]</sup>?

[1] Documented roosting or foraging habitat – for the purposes of this consultation, we are considering documented habitat as that where Indiana bats and/or NLEB have actually been captured and tracked using (1) radio telemetry to roosts; (2) radio telemetry triangulation/triangulation to estimate foraging areas; or (3) foraging areas with repeated use documented using acoustics. Documented roosting habitat is also considered as suitable summer habitat within 0.25 miles of documented roosts.)

[2] For the purposes of this key, we are considering documented corridors as that where Indiana bats and/or NLEB have actually been captured and tracked to using (1) radio telemetry; or (2) treed corridors located directly between documented roosting and foraging habitat.

No

13. Will the removal or trimming of habitat or trees occur **within** suitable but **undocumented NLEB** roosting/foraging habitat or travel corridors?

Yes

14. What time of year will the removal or trimming of habitat or trees **within** suitable but **undocumented NLEB** roosting/foraging habitat or travel corridors occur?

*C) During both the active and inactive seasons*

15. Will *any* tree trimming or removal occur **within** 100 feet of existing road/rail surfaces?

Yes

16. Will **more than** 10 trees be removed **between** 0-100 feet of the road/rail surface *during* the active season<sup>[1]</sup>?

[1] Areas containing more than 10 trees will be assessed by the local Service Field Office on a case-by-case basis with the project proponent.

Yes

17. Will *any* tree trimming or removal occur **between** 100-300 feet of existing road/rail surfaces?

No

18. Are *all* trees that are being removed clearly demarcated?

Yes

19. Will the removal of habitat or the removal/trimming of trees involve the use of **temporary** lighting?

No

20. Will the removal of habitat or the removal/trimming of trees include installing new or replacing existing **permanent** lighting?

No

21. Does the project include wetland or stream protection activities associated with compensatory wetland mitigation?

No

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22. Does the project include slash pile burning?

No

23. Does the project include *any* bridge removal, replacement, and/or maintenance activities (e.g., any bridge repair, retrofit, maintenance, and/or rehabilitation work)?

No

24. Does the project include the removal, replacement, and/or maintenance of *any* structure other than a bridge? (e.g., rest areas, offices, sheds, outbuildings, barns, parking garages, etc.)

No

25. Will the project involve the use of **temporary** lighting *during* the active season?

No

26. Will the project install new or replace existing **permanent** lighting?

No

27. Does the project include percussives or other activities (**not including tree removal/trimming or bridge/structure work**) that will increase noise levels above existing traffic/background levels?

Yes

28. Will the activities that use percussives (**not including tree removal/trimming or bridge/structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the active season<sup>[1]</sup>?

[1] Coordinate with the local Service Field Office for appropriate dates.

Yes

29. Will *any* activities that use percussives (**not including tree removal/trimming or bridge/structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the inactive season<sup>[1]</sup>?

[1] Coordinate with the local Service Field Office for appropriate dates.

Yes

30. Are *all* project activities that are **not associated with** habitat removal, tree removal/trimming, bridge and/or structure activities, temporary or permanent lighting, or use of percussives, limited to actions that DO NOT cause any additional stressors to the bat species?

Examples: lining roadways, unlighted signage , rail road crossing signals, signal lighting, and minor road repair such as asphalt fill of potholes, etc.

Yes

31. Will the project raise the road profile **above the tree canopy**?

No

32. Are the project activities that use percussives (not including tree removal/trimming or bridge/structure work) consistent with a Not Likely to Adversely Affect determination in this key?

**Automatically answered**

*Yes, because the activities are within 300 feet of the existing road/rail surface, greater than 0.5 miles from a hibernacula, and conducted during the active season within undocumented habitat.*

33. Are the project activities that use percussives (not including tree removal/trimming or bridge/structure work) and/or increase noise levels above existing traffic/background levels consistent with a No Effect determination in this key?

**Automatically answered**

*Yes, because the activities are within 300 feet of the existing road/rail surface, greater than 0.5 miles from a hibernacula, and conducted during the inactive season*

34. Is the habitat removal portion of this project consistent with a Likely to Adversely Affect determination in this key?

**Automatically answered**

*Yes, because tree removal that occurs within the NLEB's active season occurs greater than 0.5 miles from the nearest hibernaculum, is less than 100 feet from the existing road/rail surface, and is not in documented NLEB roosting/foraging habitat or travel corridors, and a visual emergence survey has not been conducted*

35. Is the habitat removal portion of this project consistent with a Not Likely to Adversely Affect determination in this key?

**Automatically answered**

*Yes, because the tree removal/trimming that occurs outside of the NLEB's active season occurs greater than 0.5 miles from the nearest hibernaculum, is less than 100 feet from the existing road/rail surface, includes clear demarcation of the trees that are to be removed, and does not alter documented roosts and/or surrounding summer habitat within 0.25 miles of a documented roost.*

36. **General AMM 1**

Will the project ensure *all* operators, employees, and contractors working in areas of known or presumed bat habitat are aware of *all* FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable Avoidance and Minimization Measures?

Yes

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**37. Tree Removal AMM 1**

Can *all* phases/aspects of the project (e.g., temporary work areas, alignments) be modified, to the extent practicable, to avoid tree removal<sup>[1]</sup> in excess of what is required to implement the project safely?

Note: Tree Removal AMM 1 is a minimization measure, the full implementation of which may not always be practicable. Projects may still be NLAA as long as Tree Removal AMMs 2, 3, and 4 are implemented and LAA as long as Tree Removal AMMs 3, 5, 6, and 7 are implemented.

[1] The word “trees” as used in the AMMs refers to trees that are suitable habitat for each species within their range. See the USFWS’ current summer survey guidance for our latest definitions of suitable habitat.

Yes

**38. Tree Removal AMM 3**

Can tree removal be limited to that specified in project plans and ensure that contractors understand clearing limits and how they are marked in the field (e.g., install bright colored flagging/fencing prior to any tree clearing to ensure contractors stay within clearing limits)?

Yes

**39. For Indiana bat, if applicable, compensatory mitigation measures are required to offset adverse effects on the species (see Section 2.10 of the BA). Please select the mechanism in which compensatory mitigation will be implemented:**

6. *Not Applicable*

## Project Questionnaire

1. Have you made a No Effect determination for *all* other species indicated on the FWS IPaC generated species list?

Yes

2. Have you made a May Affect determination for *any* other species on the FWS IPaC generated species list?

No

3. How many acres<sup>[1]</sup> of trees are proposed for removal between 0-100 feet of the existing road/rail surface?

[1] If described as number of trees, multiply by 0.09 to convert to acreage and enter that number.

0.5

4. **Please verify:**

All tree removal will occur greater than 0.5 mile from any hibernaculum.

*Yes, I verify that all tree removal will occur greater than 0.5 miles from any hibernaculum.*

5. Is the project location 0-100 feet from the edge of existing road/rail surface?

Yes

6. Is the project location 100-300 feet from the edge of existing road/rail surface?

No

7. **Please verify:**

No documented NLEB roosts or surrounding summer habitat within 150 feet of documented roosts will be impacted between June 1 and July 31.

*Yes, I verify that no documented NLEB roosts or surrounding summer habitat within 150 feet of documented roosts will be impacted during this period.*

## **Avoidance And Minimization Measures (AMMs)**

This determination key result includes the commitment to implement the following Avoidance and Minimization Measures (AMMs):

### **TREE REMOVAL AMM 3**

Ensure tree removal is limited to that specified in project plans and ensure that contractors understand clearing limits and how they are marked in the field (e.g., install bright colored flagging/fencing prior to any tree clearing to ensure contractors stay within clearing limits).

### **GENERAL AMM 1**

Ensure all operators, employees, and contractors working in areas of known or presumed bat habitat are aware of all FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable AMMs.

### **TREE REMOVAL AMM 1**

Modify all phases/aspects of the project (e.g., temporary work areas, alignments) to avoid tree removal.

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## **Determination Key Description: FHWA, FRA, FTA Programmatic Consultation For Transportation Projects Affecting NLEB Or Indiana Bat**

This key was last updated in IPaC on April 22, 2021. Keys are subject to periodic revision.

This decision key is intended for projects/activities funded or authorized by the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA), which may require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act (ESA) for the endangered **Indiana bat** (*Myotis sodalis*) and the threatened **Northern long-eared bat** (NLEB) (*Myotis septentrionalis*).

This decision key should only be used to verify project applicability with the Service's [February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects](#). The programmatic biological opinion covers limited transportation activities that may affect either bat species, and addresses situations that are both likely and not likely to adversely affect either bat species. This decision key will assist in identifying the effect of a specific project/activity and applicability of the programmatic consultation. The programmatic biological opinion is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic biological opinion, or that may affect ESA-listed species other than the Indiana bat or NLEB, or any designated critical habitat, may require additional ESA Section 7 consultation.

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## Martin, Rebecca

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**From:** Kaitlyn Shaw - NOAA Federal <kaitlyn.shaw@noaa.gov>  
**Sent:** Thursday, July 29, 2021 1:08 PM  
**To:** Martin, Rebecca  
**Cc:** Chris Boelke  
**Subject:** Re: FW: Bedford 43138: EFH Assessment, Culvert Rehabilitation on Bowman Brook

**EXTERNAL:** Do not open attachments or click on links unless you recognize and trust the sender.

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Hi Rebecca,

I've reviewed the materials and the conditions provided by the NH Department and Fish and Game should adequately protect fish habitat. We do not have CR's to provide.

Best,

### **Kaitlyn Shaw**

Marine Resources Management Specialist  
Habitat and Ecosystem Services Division  
NOAA/ National Marine Fisheries Service  
Gloucester, MA  
Office: 978-282-8457  
Pronouns: she/her/hers  
[kaitlyn.shaw@noaa.gov](mailto:kaitlyn.shaw@noaa.gov)  
[www.nmfs.noaa.gov](http://www.nmfs.noaa.gov)

On Mon, Jul 26, 2021 at 12:31 PM Martin, Rebecca <[Rebecca.A.Martin@dot.nh.gov](mailto:Rebecca.A.Martin@dot.nh.gov)> wrote:

Dear Kaitlyn,

I received a note from one of my colleagues a few moments ago indicating that you would be covering Gulf of Maine EFH consultations. I sent the attached and below to Mike Johnson earlier today. Should all FHWA (NHDOT) EFH assessments be emailed to you? Is it still appropriate to copy Christopher Boelke?

Thank you,

Rebecca

Rebecca Martin

Senior Environmental Manager

NH DOT Bureau of Environment

7 Hazen Drive

Concord, NH 03302

(603)271-6781

[Rebecca.A.Martin@dot.nh.gov](mailto:Rebecca.A.Martin@dot.nh.gov)

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**From:** Martin, Rebecca

**Sent:** Monday, July 26, 2021 12:04 PM

**To:** 'Mike R Johnson - NOAA Federal' <[mike.r.johnson@noaa.gov](mailto:mike.r.johnson@noaa.gov)>

**Cc:** Sikora, Jamie (FHWA) <[Jamie.Sikora@dot.gov](mailto:Jamie.Sikora@dot.gov)>; '[christopher.boelke@noaa.gov](mailto:christopher.boelke@noaa.gov)' <[christopher.boelke@noaa.gov](mailto:christopher.boelke@noaa.gov)>

**Subject:** Bedford 43138: EFH Assessment, Culvert Rehabilitation on Bowman Brook

Hello Mike,

I hope that this message finds you well and enjoying the summer weather.

Please find attached an EFH assessment and supporting documents for a project proposed to rehabilitate a 72” culvert carrying Bowman Brook under NH Route 114 just north of the intersection of NH Route 114, Donald Street and New Boston Road in Bedford, NH. This project proposes a slipline rehabilitation, so is not eligible for the Programmatic Agreement. The existing pipe was constructed in 1964 and is 120 foot long corrugated metal. The pipe has significant corrosion along the bottom and lower sides. Bowman Brook flows towards the south east, originating in the Walnut Hill area and eventually discharging into the Merrimack River. This project was initiated and is funded under NH Department of Transportation’s (NHDOT) Federal Culvert Replacement/Rehabilitation and Drainage Repair (CRDR) Program. The purpose of the CRDR Program is to address major culvert and drainage needs statewide that are not being addressed through current or future Capital Improvement or other programmatic projects. The project is needed to address the structural deficiencies of the culvert. If the project were not constructed, there is a risk of failure of the culvert, which would make rehabilitation impossible and could cause serious impacts to infrastructure and the travelling public. All impacts proposed are temporary, so we expect that any adverse effect on EFH would not be substantial. The project is not anticipated to require compensatory mitigation.

Bowman Brook is listed as EFH for Atlantic salmon. As I believe you are aware, restoration in the Merrimack ended in 2013, so our local fish biologists (NH fish and Game Department) do not expect Atlantic salmon to

be in the project area. During the last in-person meeting to discuss the Programmatic (2019), we were told that it is helpful to share any information from local fish biologists we have to assist with the review.

Please let me know if you have any questions or if there are additional details about the project design that I could provide that might assist with your review.

Thank you,

Rebecca Martin

Senior Environmental Manager

NH DOT Bureau of Environment

7 Hazen Drive

Concord, NH 03302

(603)271-6781

[Rebecca.A.Martin@dot.nh.gov](mailto:Rebecca.A.Martin@dot.nh.gov)

**Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding**

**Appendix B Certification – Activities with Minimal Potential to Cause Effects**

**Date Reviewed:** 7/19/2021  
(Desktop or Field Review Date)

**Project Name:** Bedford

**State Number:** 43138

**FHWA Number:** X-A005 (049)

**Environmental Contact:** Rebecca Martin

**DOT**

**Email Address:** Rebecca.a.martin@dot.nh.gov

**Project** Kirk Mudgett

**Manager:**

**Project Description:** The project proposes to rehabilitate an existing culvert that carries Bowman Brook under NH Route 114 just north of the intersection of NH Route 114, Donald Street and New Boston Road in Bedford. The existing pipe is 72 inches in diameter and 119 foot long. The existing pipe was constructed in 1964, is corrugated metal and has significant corrosion along the bottom and lower sides. Bowman Brook flows towards the south east, originating in the Walnut Hill area and eventually discharging into the Merrimack River. There are similarly sized culverts located along Bowman Brook. The preferred treatment is rehabilitation by sliplining. Liner types being considered are cured in place and polymer coated corrugated metal. The proposed design would maintain existing culvert capacity and minimize any increase in outlet velocity. If the culvert velocity increases slightly, some new stone may be placed at the outlet for scour protection. The project also proposes to repair the culvert's stone headwalls by resetting loose stones and mortar patching. This project was initiated and is funded under NH Department of Transportation's (NHDOT) Federal Culvert Replacement/Rehabilitation and Drainage Repair (CRDR) Program. The purpose of the CRDR Program is to address major culvert and drainage needs statewide that are not being addressed through current or future Capital Improvement or other programmatic projects. The project is needed to address the structural deficiencies of the culvert.

Please select the applicable activity/activities:

<b>Highway and Roadway Improvements</b>	
<input type="checkbox"/>	1. Modernization and general highway maintenance <b>that may require additional highway right-of-way or easement</b> , including: Choose an item. Choose an item.
<input type="checkbox"/>	2. Installation of rumble strips or rumble stripes
<input type="checkbox"/>	3. Installation or replacement of pole-mounted signs
<input type="checkbox"/>	4. Guardrail replacement, provided any extension does not connect to a bridge older than 50 years old (unless it does already), and there is no change in access associated with the extension
<b>Bridge and Culvert Improvements</b>	
<input type="checkbox"/>	5. Culvert replacement (excluding stone box culverts), when the culvert is less than 60" in diameter and excavation for replacement is limited to previously disturbed areas
<input type="checkbox"/>	6. Bridge deck preservation and replacement, as long as no character defining features are impacted
<input checked="" type="checkbox"/>	7. Non-historic bridge and culvert maintenance, renovation, or total replacement, <b>that may require minor additional right-of-way or easement</b> , including: a. replacement or maintenance of non-historic bridges Choose an item.
<input type="checkbox"/>	8. Historic bridge maintenance activities within the limits of existing right-of-way, including: Choose an item. Choose an item.

**Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding**

**Appendix B Certification – Activities with Minimal Potential to Cause Effects**

<input type="checkbox"/>	9. Stream and/or slope stabilization and restoration activities (including removal of debris or sediment obstructing the natural waterway, or any non-invasive action to restore natural conditions)
<b>Bicycle and Pedestrian Improvements</b>	
<input type="checkbox"/>	10. Construction of pedestrian walkways, sidewalks, sidewalk tip-downs, small passenger shelters, and alterations to facilities or vehicles in order to make them accessible for elderly and handicapped persons
<input type="checkbox"/>	11. Installation of bicycle racks
<input type="checkbox"/>	12. Recreational trail construction
<input type="checkbox"/>	13. Recreational trail maintenance when done on existing alignment
<input type="checkbox"/>	14. Construction of bicycle lanes and shared use paths and facilities within the existing right-of-way
<b>Railroad Improvements</b>	
<input type="checkbox"/>	15. Modernization, maintenance, and safety improvements of railroad facilities within the existing railroad or highway right-of-way, <b>provided no historic railroad features are impacted</b> , including, but not limited to: Choose an item. Choose an item.
<input type="checkbox"/>	16. In-kind replacement of modern railroad features (i.e. those features that are less than 50 years old)
<input type="checkbox"/>	17. Modernization/modification of railroad/roadway crossings provided that all work is undertaken within the limits of the roadway structure (edge of roadway fill to edge of roadway fill) and no associated character defining features are impacted
<b>Other Improvements</b>	
<input type="checkbox"/>	18. Installation of Intelligent Transportation Systems
<input type="checkbox"/>	19. Acquisition or renewal of scenic, conservation, habitat, or other land preservation easements where no construction will occur
<input type="checkbox"/>	20. Rehabilitation or replacement of existing storm drains.
<input type="checkbox"/>	21. Maintenance of stormwater treatment features and related infrastructure

Please describe how this project is applicable under Appendix B of the Programmatic Agreement.

The project is considered to have minimal potential to cause effects because the project work will be completed within previously disturbed areas. The corrugated metal pipe to be addressed by the project is larger than 60 inches (72 inches in diameter) and was constructed in 1964. The pipe qualifies for the NH Recordation of Bridges that Apply to the Program Comment for Common Post-1945 Concrete & Steel Bridges and is therefore not considered historic. The project area was reviewed by NHDOT’s Cultural Resources Program Specialist, Sheila Charles, using EMMIT and other desktop resources. She concluded that EMMIT shows no archaeological sites, historic properties or districts at or immediately adjacent to the project site. Please see the attached Cultural Resource Review completed by Sheila Charles.

*Please submit this Certification Form along with the Transportation RPR, including photographs, USGS maps, design plans and as-built plans, if available, for review. Note: The RPR can be waived for in-house projects, please consult Cultural Resources Program Staff.*

**Coordination Efforts:**

Has an RPR been submitted to NHDOT for this project?	No	NHDHR R&C # assigned?	Click here to enter text.
Please identify public outreach effort contacts; method of outreach and date:	Initial contact letters were distributed to local public officials on 5/12/2021		

Finding: (To be filled out by NHDOT Cultural Resources Staff )

**Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding**

**Appendix B Certification – Activities with Minimal Potential to Cause Effects**

<input checked="" type="checkbox"/>	<b>No Potential to Cause Effects</b>	<input type="checkbox"/>	<b>No Historic Properties Affected</b>
This finding serves as the Section 106 Memorandum of Effect. No further coordination is necessary.			
<input type="checkbox"/>	<b>This project does <i>not</i> comply with Appendix B. Review will continue under Stipulation VII of the Programmatic Agreement. Please contact NHDOT Cultural Resources Staff to determine next steps.</b>		
NHDOT comments:			
		7/20/2021	
_____		_____	
NHDOT Cultural Resources Staff		Date	

Coordination of the Section 106 process should begin as early as possible in the planning phase of the project (undertaking) so as not to cause a delay.

Project sponsors should not predetermine a Section 106 finding under the assumption a project is limited to the activities listed in Appendix B until this form is signed by the NHDOT Bureau of Environment Cultural Resources Program staff.

Every project shall be coordinated with, and reviewed by the NHDOT-BOE Cultural Resources Program in accordance with the *Programmatic Agreement Among the Federal Highway Administration, the New Hampshire State Historic Preservation Office, the Army Corps of Engineers, New England District, the Advisory Council on Historic Preservation, and the New Hampshire Department of Transportation Regarding the Federal Aid Highway Program in New Hampshire*. In accordance with the Advisory Council’s regulations, we will continue to consult, as appropriate, as this project proceeds.

If any portion of the project is not entirely limited to any one or a combination of the activities specified in Appendix B (with, or without the inclusion of any activities listed in Appendix A), please continue discussions with NHDOT Cultural Resources staff.

**This No Potential to Cause Effect or No Historic Properties Affected project determination is your Section 106 finding, as defined in the Programmatic Agreement.**

Should project plans change, please inform the NHDOT Cultural Resources staff in accordance with Stipulation VII of the Programmatic Agreement.

# New Hampshire Recordation of Bridges that Apply to the Program Comment for Common Post-1945 Concrete & Steel Bridges

Pipe Inlet:

**Project Name:** Bedford

**State Number:** 43138

**FHWA Number:** X-A005 (049)

**Form Completed by:** Rebecca Martin  
Email if not NHDOT staff: [Click here to enter text.](#)

**Date:** 7/16/21

Inlet:



**Reviewed by:**

*Sheila Charles*

NHDOT Cultural Resources Staff

**Date Reviewed:** 7/20/2021

**Approved**

**Not Approved**

**Justification:** 1964 Corrugated metal pipe

RPR Number: \_\_\_\_\_

Reviewed under PA:   X  

Created March 27, 2014

Updated September 15, 2014

Please refer to the *NHDOT Guidance on Using the Program Comment for Common Post-1945 Concrete and Steel Bridges*, located on the NHDOT Bureau of Environment Website, for information on using this form:

<http://www.nh.gov/dot/org/projectdevelopment/environment/units/program-management/cultural.htm>

Information on specific bridges can be found on the NHDOT Bureau of Bridge Design **Bridge Summary** Spreadsheet:

<http://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents.htm>.

(Additional photographs may be attached here if needed).

**Town: Bedford**

**NHDOT Bridge No.**  
N/A

**Year Built (rebuilt):**  
1964

**Owner: NHDOT**

**Road carrying: NH**  
**Route 114**

**Over feature:**  
**Bowman Brook**

**Bridge/culvert**  
**Type: corrugated**  
**metal pipe**

**Number of Spans:**  
N/A

**Length: 119'**

**Width: 72" diameter**

**Abutment style:**  
N/A

**Pier style: N/A**

**Rail Type: N/A**

**Rail installation**  
**date: N/A**

**Designer/Engineer**  
(if known)  
Unknown,  
constructed by  
Project P49881

**Bridge Plaques or**  
**Engravings? N/A**

**SADES ID: 15446**

# New Hampshire Recordation of Bridges that Apply to the Program Comment for Common Post-1945 Concrete & Steel Bridges

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Pipe Inlet:



Inside pipe:



Reviewed by:

*Sheila Charles*

NHDOT Cultural Resources Staff

Date Reviewed:

7/20/2021

Approved

Not Approved

Justification:

1964 Corrugated metal pipe

RPR Number: \_\_\_\_\_

Reviewed under PA:   X  

Created March 27, 2014

Updated September 15, 2014

Outlet:



Pipe Inlet:





**US Army Corps  
of Engineers**®  
New England District

## Appendix B

### **Regional General Permits (GPs) Required Information and Corps Secondary Impacts Checklist**

In order for the Corps of Engineers to properly evaluate your application, applicants must submit the following information along with the New Hampshire DES Wetlands Bureau application or permit notification forms. Some projects may require more information. For a more comprehensive checklist, go to [www.nae.usace.army.mil/regulatory](http://www.nae.usace.army.mil/regulatory), “Forms/Publications” and then “Application and Plan Guideline Checklist.” Check with the Corps at (978) 318-8832 for project-specific requirements. For your convenience, this Appendix B is also attached to the State of New Hampshire DES Wetlands Bureau application and Permit by Notification forms.

#### **All Projects:**

- Corps application form ([ENG Form 4345](#)) as appropriate.
- Photographs of wetland/waterway to be impacted.
- Purpose of the project.
- Legible, reproducible black and white (no color) plans no larger than 11”x17” with bar scale. Provide locus map and plan views of the entire property.
- Typical cross-section views of all wetland and waterway fill areas and wetland replication areas.
- In navigable waters, show mean low water (MLW) and mean high water (MHW) elevations. Show the high tide line (HTL) elevations when fill is involved. In other waters, show ordinary high water (OHW) elevation.
- On each plan, show the following for the project:
- Vertical datum and the NAVD 1988 equivalent with the vertical units as U.S. feet. Don’t use local datum. In coastal waters this may be mean higher high water (MHHW), mean high water (MHW), mean low water (MLW), mean lower low water (MLLW) or other tidal datum with the vertical units as U.S. feet. MLLW and MHHW are preferred. Provide the correction factor detailing how the vertical datum (e.g., MLLW) was derived using the latest National Tidal Datum Epoch for that area, typically 1983-2001.
- Horizontal state plane coordinates in U.S. survey feet based on the Traverse Mercator Grid system for the State of New Hampshire (Zone 2800) NAD 83.
- Show project limits with existing and proposed conditions.
- Limits of any Federal Navigation Project in the vicinity of the project area and horizontal State Plane Coordinates in U.S. survey feet for the limits of the proposed work closest to the Federal Navigation Project;
- Volume, type, and source of fill material to be discharged into waters and wetlands, including the area(s) (in square feet or acres) of fill in wetlands, below the ordinary high water in inland waters and below the high tide line in coastal waters.
- Delineation of all waterways and wetlands on the project site,;
- Use Federal delineation methods and include Corps wetland delineation data sheets. See GC 2 and [www.nero.noaa.gov/hcd](http://www.nero.noaa.gov/hcd) for eelgrass survey guidance.
- GP 3, Moorings, contains eelgrass survey requirements for the placement of moorings.
- For activities involving discharges of dredged or fill material into waters of the U.S., include a statement describing how impacts to waters of the U.S. are to be avoided and minimized, and either a statement describing how impacts to waters of the U.S. are to be compensated for (or a conceptual or detailed mitigation plan) or a statement explaining why compensatory mitigation should not be required for the proposed impacts. Please contact the Corps for guidance.



**US Army Corps  
of Engineers**®  
New England District

**New Hampshire General Permits (GPs)  
Appendix B - Corps Secondary Impacts Checklist  
(for inland wetland/waterway fill projects in New Hampshire)**

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to “work” include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See GC 5, regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

<b>1. Impaired Waters</b>	Yes	No
1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water? See <a href="http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm">http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm</a> to determine if there is an impaired water in the vicinity of your work area.*		X
<b>2. Wetlands</b>	Yes	No
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?	X	
2.2 Are there proposed impacts to SAS, special wetlands. Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) DataCheck Tool for information about resources located on the property at <a href="https://www2.des.state.nh.us/nhb_datacheck/">https://www2.des.state.nh.us/nhb_datacheck/</a> . The book <a href="#">Natural Community Systems of New Hampshire</a> also contains specific information about the natural communities found in NH.		X
2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?	X	
2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)	X	
2.5 The overall project site is more than 40 acres?		X
2.6 What is the area of the previously filled wetlands?	Unknown	
2.7 What is the area of the proposed fill in wetlands?	None	
2.8 What is the % of previously and proposed fill in wetlands to the overall project site?	Unknown	
<b>3. Wildlife</b>	Yes	No
3.1 Has the NHB & USFWS determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require an NHB ID number & a USFWS IPAC determination.) NHB DataCheck Tool: <a href="https://www2.des.state.nh.us/nhb_datacheck/">https://www2.des.state.nh.us/nhb_datacheck/</a> USFWS IPAC website: <a href="https://ecos.fws.gov/ipac/location/index">https://ecos.fws.gov/ipac/location/index</a>	X	

3.2 Would work occur in any area identified as either “Highest Ranked Habitat in N.H.” or “Highest Ranked Habitat in Ecological Region”? (These areas are colored magenta and green, respectively, on NH Fish and Game’s map, “2010 Highest Ranked Wildlife Habitat by Ecological Condition.”) Map information can be found at: <ul style="list-style-type: none"> <li>• PDF: <a href="http://www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/highest_ranking_habitat.htm">www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/highest_ranking_habitat.htm</a>.</li> <li>• Data Mapper: <a href="http://www.granit.unh.edu">www.granit.unh.edu</a>.</li> <li>• GIS: <a href="http://www.granit.unh.edu/data/downloadfreedata/category/databycategory.html">www.granit.unh.edu/data/downloadfreedata/category/databycategory.html</a>.</li> </ul>		X
3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?		X
3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		X
3.5 Are stream crossings designed in accordance with the GC 21?	X	
<b>4. Flooding/Floodplain Values</b>	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?	X	
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?	n/a	
<b>5. Historic/Archaeological Resources</b>		
For a minimum, minor or major impact project - a copy of the Request for Project Review (RPR) Form ( <a href="http://www.nh.gov/nhdhr/review">www.nh.gov/nhdhr/review</a> ) with your DES file number shall be sent to the NH Division of Historical Resources as required on Page 11 GC 8(d) of the GP document**	n/a	

\*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.

\*\* If your project is not within Federal jurisdiction, coordination with NH DHR is not required under Federal law.

Supplemental Information:

2.6 & 2.8 - The amount of fill previously placed in wetlands is unknown. Based on the width of the existing stream channel, previous construction would have filled about 0.12 acres.

4.2 - No fill in the 100 year floodplain is proposed.

5 - The project qualifies for the Section 106 Programmatic Agreement among the Federal Highway Administration, the New Hampshire State Historic Preservation Office, the Army Corps of Engineers, New England District, the Advisory Council on Historic Preservation, and NHDOT. Therefore, no RPR was submitted to NHDHR.



Image capture: Aug 2019 © 2021 Google

Site looking north



By NHDOT Bureau of Environment 11/20/2020

Culvert inlet

Wetland #1, ponded area (PUB3Hh/EM1Fb) - Impact Area A



By NHDOT Highway Design 7/1/2021

Culvert inlet

Wetland #1, ponded area (PUB3Hh/EM1Fb) - Impact Area A



By NHDOT Highway Design 12/18/2018

Just inside of inlet, looking downstream, showing heavy rust and some perforations along waterline. Shape still intact



By NHDOT Highway Design 12/18/2018

Outlet

Channel: Wetland #2 (R2UB12)- Impact Area B

Bank right: Wetland #3 (BANK) - Impact Area C      Bank left: Wetland #4 (BANK) - Impact Area D



By NHDOT Highway Design 7/1/2021

Outlet

Channel: Wetland #2 (R2UB12)- Impact Area B



By NHDOT Highway Design 7/1/2021

Access to inlet, looking north  
No impact areas in this photo



By NHDOT Highway Design 7/1/2021

Access to inlet, looking north  
Wetland #1, ponded area (PUB3Hh/EM1Fb) - Impact Area A



By NHDOT Highway Design 7/1/2021

Access to outlet, looking south  
No impact areas in this photo



By NHDOT Bureau of Environment 11/20/2020

Access to outlet from upper left in photo  
Channel: Wetland #2 (R2UB12)- Impact Area B  
Bank right: Wetland #3 (BANK) - Impact Area C      Bank left: Wetland #4 (BANK) - Impact Area D

## Bedford 43138

### CONSTRUCTION SEQUENCE

**Dewatering basins, water diversion structures, and other temporary measures shown on the Erosion Control Plans are approximate. Type, size, and location will be as per the Contractor's approved SWPPP.**

1. Perform any necessary clearing operations for access and staging.
2. Install perimeter sediment controls and install necessary temporary erosion controls as specified on the strategies sheet. Include all staging areas. Set up dewatering basin.
3. Construct temporary inlet and outlet access roads. Access road impacts in wetland areas are intended to be temporary. Trees may be cut but stumps and root mat shall not be removed in wetland areas so that vegetation can re-establish naturally. Temporary access roads shall be constructed in a way that will protect the wetland vegetation beneath by implementing a barrier such as timber mats, or a stone or aggregate base over geotextile that will also address any concentrated flows along or beneath the constructed access road and minimize impacts to water quality.
4. Install water diversion at inlet and other sedimentation controls/BMP's as needed.
5. Clean water bypass shall be through the existing pipe, unless otherwise approved as part of the Contractor's SWPPP.
6. Clean and inspect existing pipe.
7. Repair pipe invert as needed, grout any voids around outside of pipe.
8. Install cured in place liner.
9. Repair inlet and outlet headwalls (reset missing stones, re-point mortar joints).
10. Fill any sinkholes behind inlet and outlet headwalls.
11. Remove water diversion, and re-establish flow through the culvert.
12. Remove temporary access roads.
13. Stabilize disturbed areas with seed, mulch, and temporary slope matting (where steeper than 4:1). Seed placed in jurisdictional wetland areas shall be a wetland seed mix.
14. Remove erosion and sediment controls once the site is stabilized.



Revised: 2020

— Lot Line      - - - - ROW Paper Line      [ ] Open Water      - - - - Easement Line  
 - - - - ROW Dirt Line      - - - - - ROW Private Line      [ ] Streams  
 — ROW Line      - - - - - Town Boundary      [ ] Index Map

# BEDFORD, NH

1 in = 250 ft

0 125 250 Feet

0 250 500 Feet

1

NHDOT Bedford 43138 Project Abutters

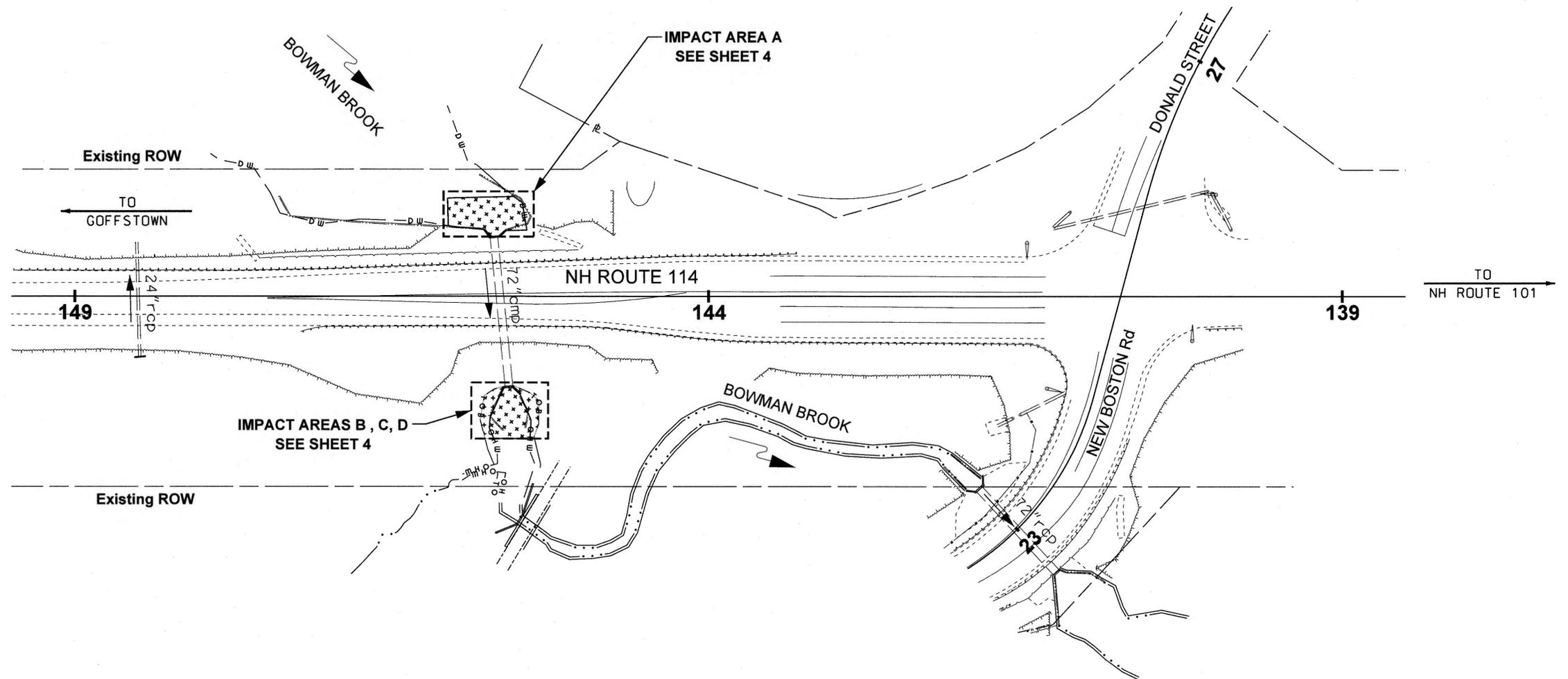
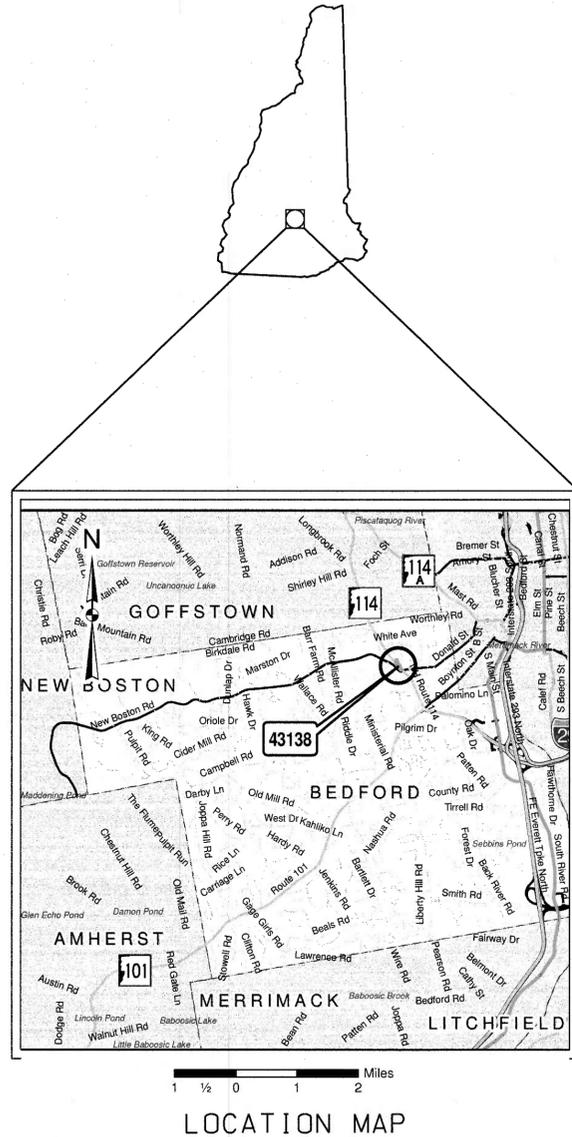
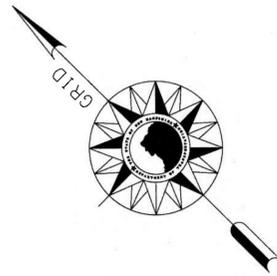
Name	Mailing Address	Tax Map & Lot
Public Service Co of NH	PO Box 330, Manchester NH 03101	1-33-3
Mark & Patricia Schappler	33 Holbrook Rd, Bedford, NH 03110	10-37

STATE OF NEW HAMPSHIRE  
DEPARTMENT OF TRANSPORTATION  
**WETLANDS PLANS**  
**FEDERAL AID PROJECT**

X-A005(049)  
N.H. PROJECT NO. 43138  
NH Route 114

DESIGN DATA

AVERAGE DAILY TRAFFIC 20 19	17,816
AVERAGE DAILY TRAFFIC 20 XX	N/A
PERCENT OF TRUCKS	9%
DESIGN SPEED	N/A
LENGTH OF PROJECT	119 LF (culvert)



DATE 10/2021  
DATE 11/17/21  
DRAWN BY JJN  
CHECKED BY CAC

- INDEX OF SHEETS
- 1 FRONT SHEET
  - 2-3 STANDARD SYMBOLS SHEETS
  - 4 WETLAND IMPACT PLAN
  - 5 PROFILES & DETAILS
  - 6 EROSION CONTROL STRATEGIES
  - 7 EROSION CONTROL PLAN

Wetland Delineation per ENV-Wt 406 by:  
NHDOT (Rebecca Martin)  
June 24, 2021

**TOWN OF BEDFORD**  
COUNTY OF HILLSBOROUGH  
SCALE: 1" = 50'

Plans Prepared by:  
Christopher Carucci, PE  
DATE 11/17/2021

Per Wetland Plans Rule(s)  
Env-Wt 311.05

**NHDOT** THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

NH ROUTE 114  
Culvert Replacement  
Wetland Impact and  
Erosion Control Plans

FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
X-A005(049)	43138	1	7

FOR CONSTRUCTION AND ALIGNMENT DETAILS - SEE CONSTRUCTION PLANS

# GENERAL

EDGE OF PAVEMENT TRAVELED WAY			
DRIVEWAYS			(label surface type)
BUILDINGS			(label house or type of building) (building to be removed)
FOUNDATION			(label type)
LEACH FIELD			leach field
BRIDGE CROSSINGS			STREAM OVERPASS
STEPS AND WALK			(label type)
INTERMITTENT WATER COURSE			
SHORE LINE			river/stream pond (label name of water body)
POTENTIAL WET AREA SYMBOL			
BRUSH OR WOODS LINE			
TREES (PLANS)			(deciduous)(coniferous) (stump)
TREE OR STUMP (CROSS-SECTIONS)			(show station, circumference in feet & type)
HEDGE			(label type)
MONITORING WELL			mon W
WELL			W
FLAG POLE			fp

ORIGINAL GROUND (TYPICALS)	
ROCK OUTCROP	
ROCK LINE (TYPICALS & SECTIONS ONLY)	
GUARDRAIL (label type)	
JERSEY BARRIER	
CURB (LABEL TYPE)	
STONE WALL	
RETAINING WALL (LABEL TYPE)	
FENCE (LABEL TYPE)	
SIGNS	
GAS PUMP	
FUEL TANK (ABOVE GROUND)	
STORAGE TANK FILLER CAP	
SEPTIC TANK	
GRAVE	
MAILBOX	
VENT PIPE	
SATELLITE DISH ANTENNA	
PHONE	
GROUND LIGHT/LAMP POST	
BORING LOCATION	
TEST PIT	
INTERSTATE NUMBERED HIGHWAY	
UNITED STATES NUMBERED HIGHWAY	
STATE NUMBERED HIGHWAY	

# SHORELAND - WETLAND

WETLAND DESIGNATION AND TYPE	
DELINEATED WETLAND	
ORDINARY HIGH WATER	
TOP OF BANK	
TOP OF BANK & ORDINARY HIGH WATER	
NORMAL HIGH WATER	
WIDTH AT BANK FULL	
PRIME WETLAND	
PRIME WETLAND 100' BUFFER	
NON-JURISDICTIONAL DRAINAGE AREA	
COWARDIN DISTINCTION LINE	
TIDAL BUFFER ZONE	
DEVELOPED TIDAL BUFFER ZONE	
HIGHEST OBSERVABLE TIDE LINE	
MEAN HIGH WATER	
MEAN LOW WATER	
VERNAL POOL	
SPECIAL AQUATIC SITE	
REFERENCE LINE	
WATER FRONT BUFFER	
NATURAL WOODLAND BUFFER	
PROTECTED SHORELAND	
INVASIVE SPECIES LABEL	
INVASIVE SPECIES	

# FLOODPLAIN / FLOODWAY

500 YEAR FLOODPLAIN BOUNDARY	
100 YEAR FLOODPLAIN BOUNDARY	
FLOODWAY	

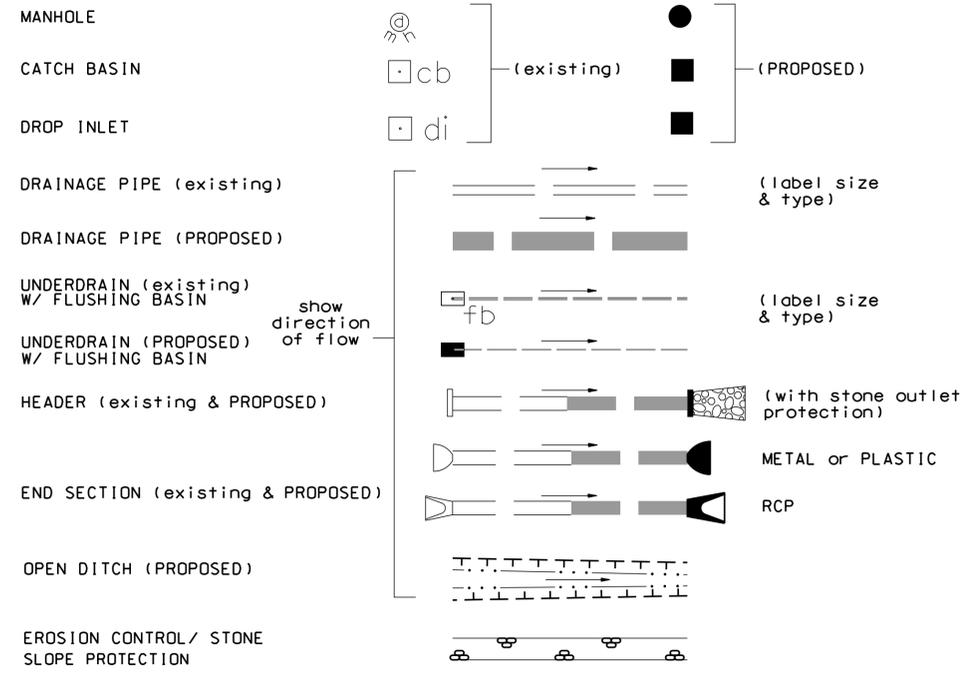
# ENGINEERING

CONSTRUCTION BASELINE	
PC, PT, POT (ON CONST BASELINE)	
PI (IN CONSTRUCTION BASELINES)	
INTERSECTION OR EQUATION OF TWO LINES	
ORIGINAL GROUND LINE (PROFILES AND CROSS-SECTIONS)	
PROFILE GRADE LINE (PROFILES AND CROSS-SECTIONS)	
CLEARING LINE	
SLOPE LINE	
SLOPE LINE (FILL)	
SLOPE LINE (CUT)	
PROFILES AND CROSS SECTIONS:	
ORIGINAL GROUND ELEVATION (LEFT)	
FINISHED GRADE ELEVATION (RIGHT)	

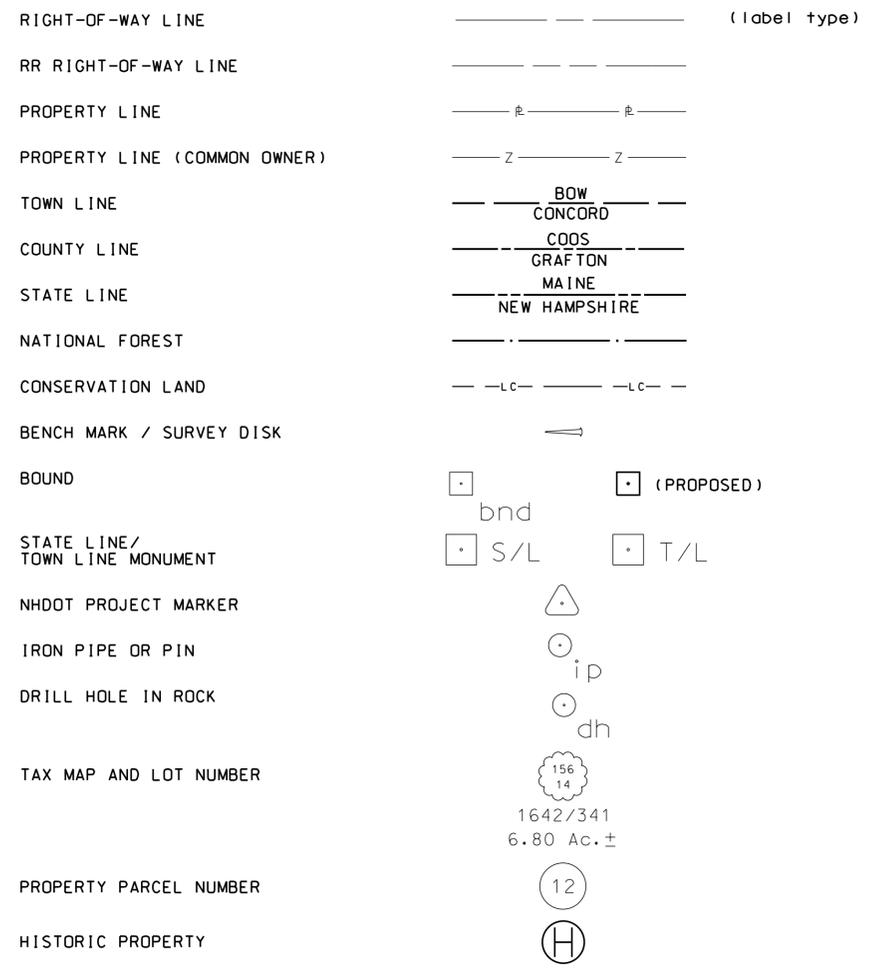
STATE OF NEW HAMPSHIRE BEDFORD	
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN	
<b>STANDARD SYMBOLS</b>	

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
11-21-2014	43138 stdsyml-2	43138	2	7

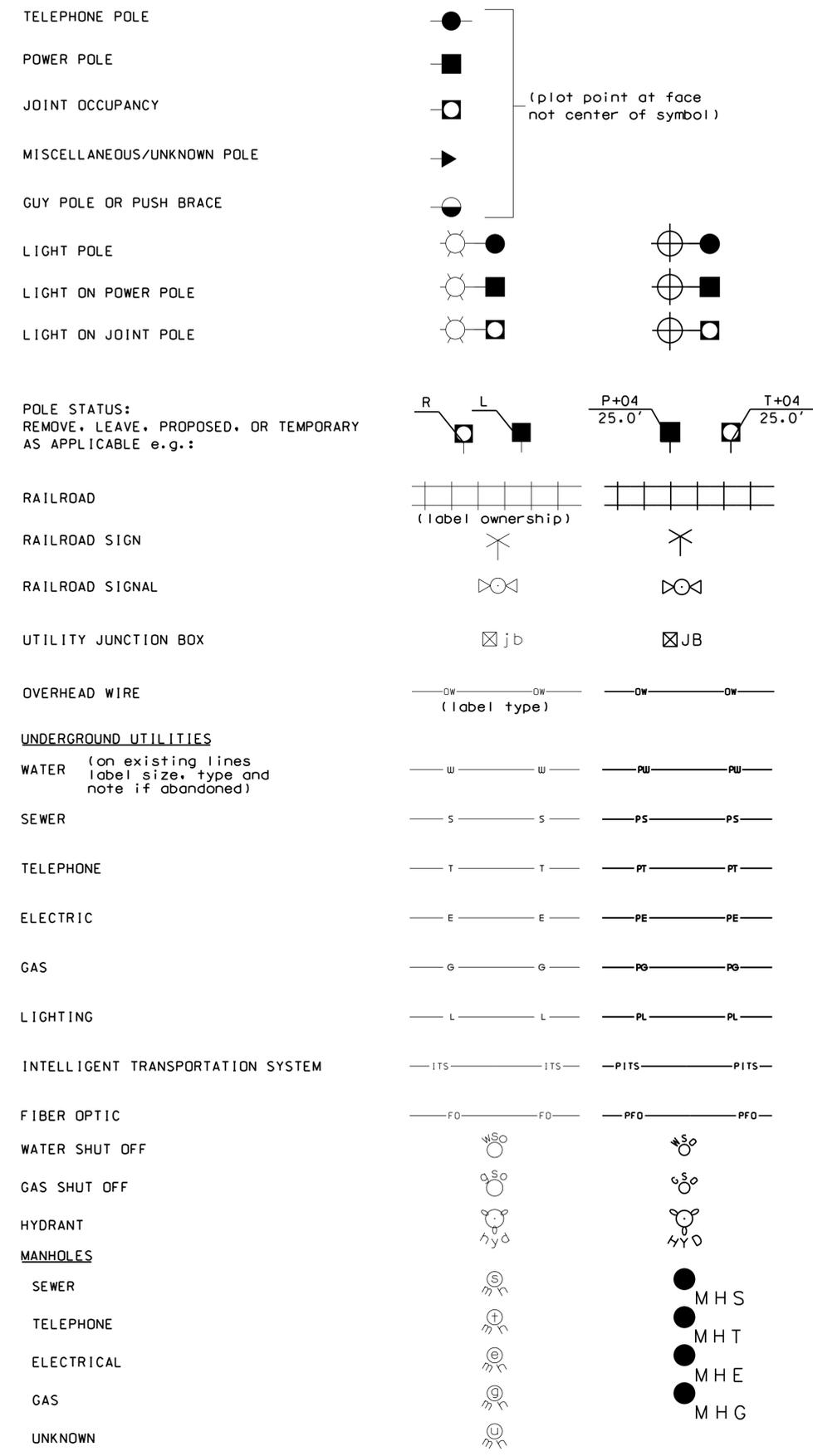
## DRAINAGE



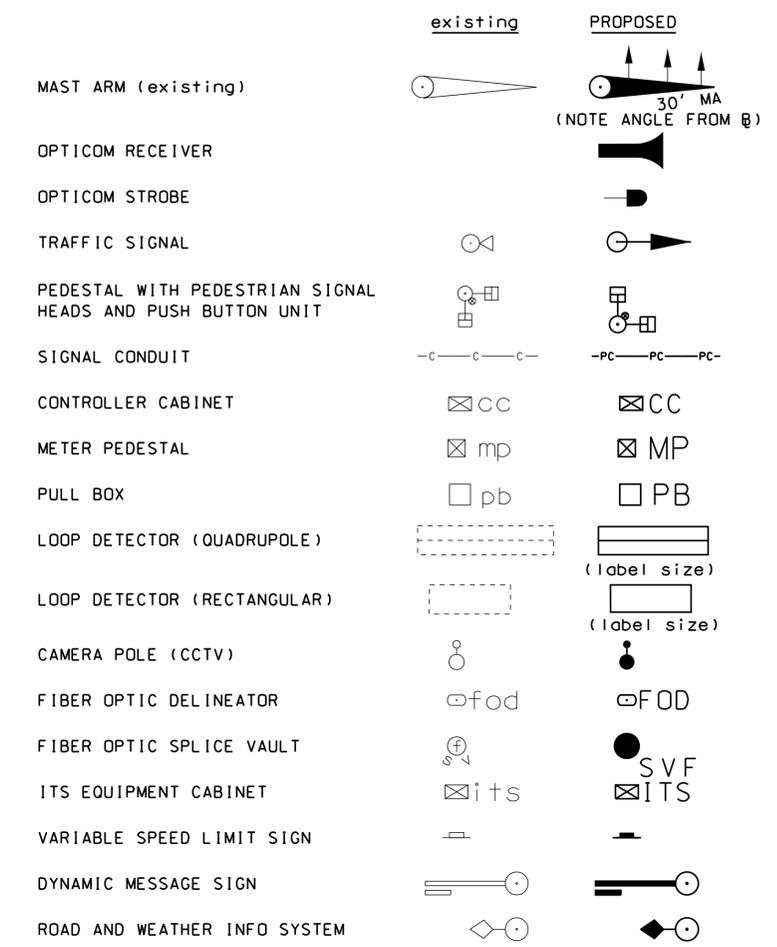
## BOUNDARIES / RIGHT-OF-WAY



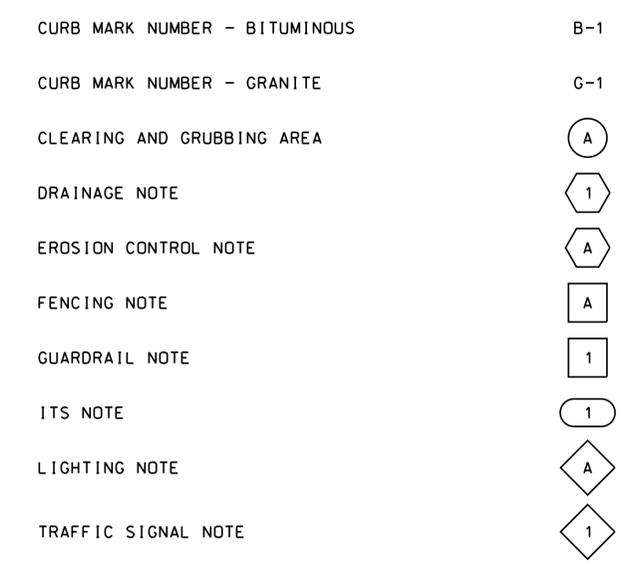
## UTILITIES

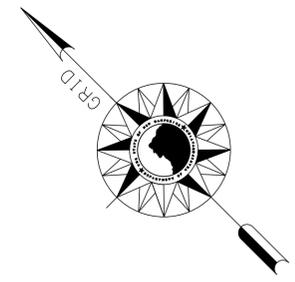
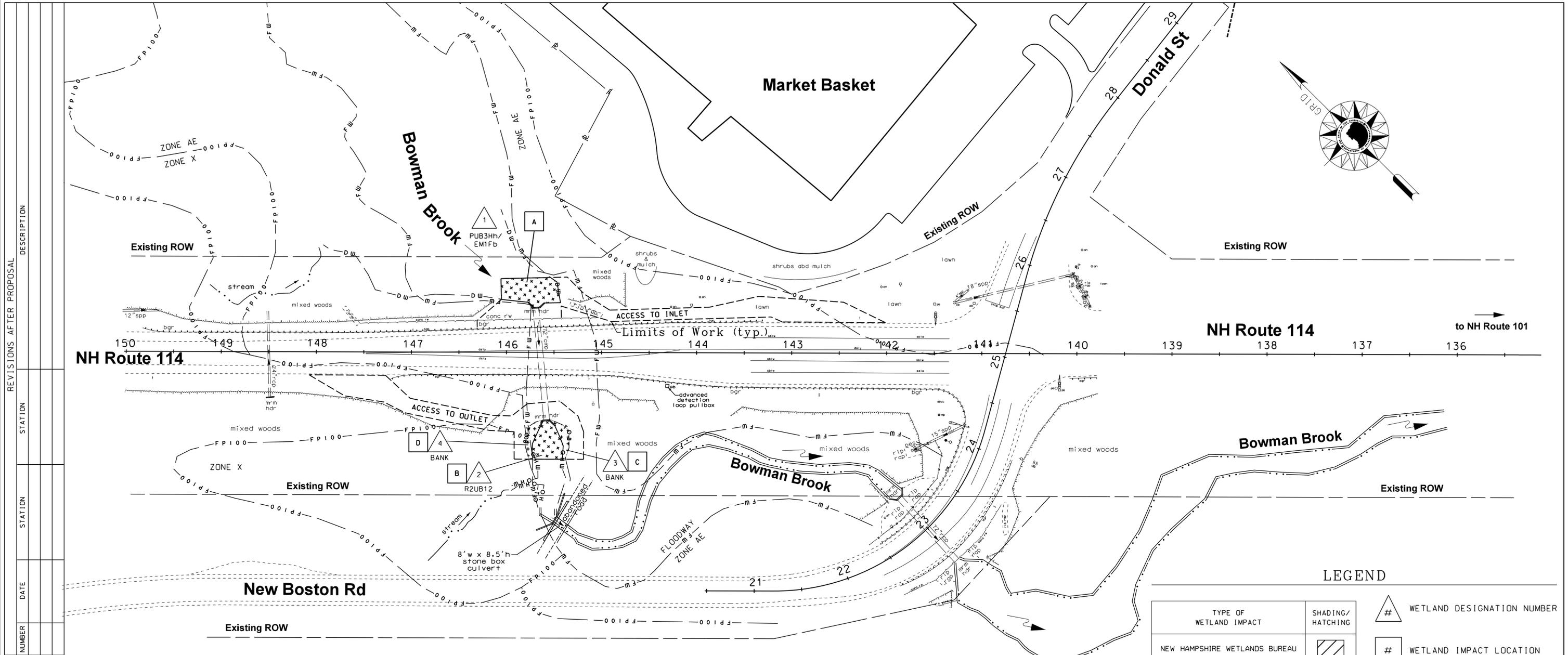


## TRAFFIC SIGNALS / ITS



## CONSTRUCTION NOTES





SDR PROCESSED	SEL	DATE	6/2021
NEW DESIGN	CAC	DATE	9/2021
SHEET CHECKED	JUN	DATE	11/2021
AS BUILT DETAILS		DATE	

TYPE OF WETLAND IMPACT		SHADING/HATCHING	WETLAND DESIGNATION NUMBER
NEW HAMPSHIRE WETLANDS BUREAU (PERMANENT NON-WETLAND)			#
NEW HAMPSHIRE WETLANDS BUREAU & ARMY CORP OF ENGINEERS (PERMANENT WETLAND)			#
TEMPORARY IMPACTS			#
			MITIGATION

WETLAND NUMBER	WETLAND CLASSIFICATION	LOCATION	AREA IMPACTS						LINEAR STREAM IMPACTS FOR MITIGATION			
			PERMANENT			TEMPORARY			PERMANENT			
			N.H.W.B. (NON-WETLAND)	SF	LF	N.H.W.B. & A.C.O.E. (WETLAND)	SF	LF	SF	LF	BANK LEFT	BANK RIGHT
1	PUB3Hh/EM1Fb	A	--	--	--	--	1547	--	--	--	--	--
2	R2UB12	B	--	--	--	--	1009	40	--	--	--	--
3	BANK	C	--	--	--	--	302	49	--	--	--	--
4	BANK	D	--	--	--	--	336	47	--	--	--	--
TOTAL			0	0	0	0	3,194	136	0	0	0	0

WETLAND CLASSIFICATION CODES	
PUB3Hh/EM1Fb	Palustrine, Unconsolidated Bottom, Mud, Permanently Flooded, Diked/Impounded/Emergent, Persistent, Semipermanently Flooded, Beaver
R2UB12	RIVERINE, LOWER PERENNIAL, UNCONSOLIDATED BOTTOM, COBBLE GRAVEL / SAND
BANK	BANK

STA 145+65  
 REHABILITATE EXISTING 72" X 119' LONG CORRUGATED METAL CULVERT: SLOPE 119 LF OF 72" CMP WITH CURED IN PLACE LINER.  
 REPAIR MRM INLET AND OUTLET HEADWALLS.  
 REPAIR SINKHOLES BEHIND INLET HEADWALL.  
 CONSTRUCT AND REMOVE TEMPORARY ACCESS ROADS TO INLET AND OUTLET. RESTORE DISTURBED AREAS TO EXISTING CONDITIONS. USE WETLAND SEED MIX TO RESTORE JURISDICTIONAL WETLAND AREAS.  
 NO PERMANENT CHANGE TO TOPOGRAPHY, NO PROPOSED CONTOURS.

PERMANENT IMPACTS: 0 SF  
 TEMPORARY IMPACTS: 3,194 SF  
 TOTAL IMPACTS: 3,194 SF



STATE OF NEW HAMPSHIRE BEDFORD			
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN			
<b>WETLAND IMPACT PLAN</b>			
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43138wetplan	43138	4	7



# EROSION CONTROL STRATEGIES

1. ENVIRONMENTAL COMMITMENTS:
  - 1.1. THESE GUIDELINES DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH ANY CONTRACT PROVISIONS, OR APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS.
  - 1.2. THIS PROJECT WILL BE SUBJECT TO THE US EPA'S NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORM WATER CONSTRUCTION GENERAL PERMIT AS ADMINISTERED BY THE ENVIRONMENTAL PROTECTION AGENCY (EPA). THIS PROJECT IS SUBJECT TO REQUIREMENTS IN THE MOST RECENT CONSTRUCTION GENERAL PERMIT (CGP).
  - 1.3. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE NHDES WETLAND PERMIT, THE US ARMY CORPS OF ENGINEERS PERMIT, WATER QUALITY CERTIFICATION AND THE SPECIAL ATTENTION ITEMS INCLUDED IN THE CONTRACT DOCUMENTS.
  - 1.4. ALL STORM WATER, EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE NEW HAMPSHIRE STORMWATER MANUAL, VOLUME 3, EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION (DECEMBER 2008) (BMP MANUAL) AVAILABLE FROM THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES (NHDES).
  - 1.5. THE CONTRACTOR SHALL COMPLY WITH RSA 485-A:17, AND ALL, PUBLISHED NHDES ALTERATION OF TERRAIN ENV-WO 1500 REQUIREMENTS ([HTTP://DES.NH.GOV/ORGANIZATION/COMMISSIONER/LEGAL/RULES/INDEX.HTM](http://des.nh.gov/organization/commissioner/legal/rules/index.htm))
  - 1.6. THE CONTRACTOR IS DIRECTED TO REVIEW AND COMPLY WITH SECTION 107.1 OF THE CONTRACT AS IT REFERS TO SPILLAGE, AND ALSO WITH REGARDS TO EROSION, POLLUTION, AND TURBIDITY PRECAUTIONS.
2. STANDARD EROSION CONTROL SEQUENCING APPLICABLE TO ALL CONSTRUCTION PROJECTS:
  - 2.1. PERIMETER CONTROLS SHALL BE INSTALLED PRIOR TO EARTH DISTURBING ACTIVITIES. PERIMETER CONTROLS AND STABILIZED CONSTRUCTION EXITS SHALL BE INSTALLED AS SHOWN IN THE BMP MANUAL AND AS DIRECTED BY THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARER.
  - 2.2. EROSION, SEDIMENTATION CONTROL MEASURES AND INFILTRATION BASINS SHALL BE CLEANED, REPLACED AND AUGMENTED AS NECESSARY TO PREVENT SEDIMENTATION BEYOND PROJECT LIMITS THROUGHOUT THE PROJECT DURATION.
  - 2.3. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT AND SECTION 645 OF THE NHDOT SPECIFICATIONS FOR ROAD AND BRIDGES CONSTRUCTION.
  - 2.4. AN AREA SHALL BE CONSIDERED STABLE IF ONE OF THE FOLLOWING HAS OCCURRED:
    - (A) BASE COURSE GRAVELS HAVE BEEN INSTALLED IN AREAS TO BE PAVED;
    - (B) A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
    - (C) A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIP-RAP HAS BEEN INSTALLED;
    - (D) TEMPORARY SLOPE STABILIZATION CONFORMING TO TABLE 1 HAS BEEN PROPERLY INSTALLED
  - 2.5. ALL STOCKPILES SHALL BE CONTAINED WITH A PERIMETER CONTROL. IF THE STOCKPILE IS TO REMAIN UNDISTURBED FOR MORE THAN 14 DAYS, MULCHING WILL BE REQUIRED.
  - 2.6. A WATER TRUCK SHALL BE AVAILABLE TO CONTROL EXCESSIVE DUST AT THE DIRECTION OF THE CONTRACT ADMINISTRATOR.
  - 2.7. TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL REMAIN UNTIL THE AREA HAS BEEN PERMANENTLY STABILIZED.
  - 2.8. CONSTRUCTION PERFORMED ANY TIME BETWEEN NOVEMBER 30<sup>th</sup> AND MAY 1<sup>st</sup> OF ANY YEAR SHALL BE CONSIDERED WINTER CONSTRUCTION AND SHALL CONFORM TO THE FOLLOWING REQUIREMENTS.
    - (A) ALL PROPOSED VEGETATED AREAS WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15<sup>th</sup>, OR WHICH ARE DISTURBED AFTER OCTOBER 15<sup>th</sup>, SHALL BE STABILIZED IN ACCORDANCE WITH TABLE 1.
    - (B) ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15<sup>th</sup>, OR WHICH ARE DISTURBED AFTER OCTOBER 15<sup>th</sup>, SHALL BE STABILIZED TEMPORARILY WITH STONE OR IN ACCORDANCE WITH TABLE 1.
    - (C) AFTER NOVEMBER 30<sup>th</sup> INCOMPLETE ROAD SURFACES, WHERE WORK HAS STOPPED FOR THE SEASON, SHALL BE PROTECTED IN ACCORDANCE WITH TABLE 1.
    - (D) WINTER EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRE OF THE PROJECT IS WITHOUT STABILIZATION AT ONE TIME, UNLESS A WINTER CONSTRUCTION PLAN HAS BEEN APPROVED BY NHDOT THAT MEETS THE REQUIREMENTS OF ENV-WO 1505.02 AND ENV-WO 1505.05.
    - (E) A SWPPP AMENDMENT SHALL BE SUBMITTED TO THE DEPARTMENT, FOR APPROVAL, ADDRESSING COLD WEATHER STABILIZATION (ENV-WO 1505.05) AND INCLUDING THE REQUIREMENTS OF NO LESS THAN 30 DAYS PRIOR TO THE COMMENCEMENT OF WORK SCHEDULED AFTER NOVEMBER 30<sup>th</sup>.

## GENERAL CONSTRUCTION PLANNING AND SELECTION OF STRATEGIES TO CONTROL EROSION AND SEDIMENT ON HIGHWAY CONSTRUCTION PROJECTS

3. PLAN ACTIVITIES TO ACCOUNT FOR SENSITIVE SITE CONDITIONS:
  - 3.1. CLEARLY FLAG AREAS TO BE PROTECTED IN THE FIELD AND PROVIDE CONSTRUCTION BARRIERS TO PREVENT TRAFFICKING OUTSIDE OF WORK AREAS.
  - 3.2. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS.
  - 3.3. PROTECT AND MAXIMIZE EXISTING NATIVE VEGETATION AND NATURAL FOREST BUFFERS BETWEEN CONSTRUCTION ACTIVITY AND SENSITIVE AREAS.
  - 3.4. WHEN WORK IS PERFORMED IN AND NEAR WATER COURSES, STREAM FLOW DIVERSION METHODS SHALL BE IMPLEMENTED PRIOR TO ANY EXCAVATION OR FILLING.
  - 3.5. WHEN WORK IS PERFORMED WITHIN 50 FEET OF SURFACE WATERS (WETLAND, OPEN WATER OR FLOWING WATER), PERIMETER CONTROL SHALL BE ENHANCED CONSISTENT WITH SECTION 2.1.2.1. OF THE 2012 NPDES CONSTRUCTION GENERAL PERMIT.
4. MINIMIZE THE AMOUNT OF EXPOSED SOIL:
  - 4.1. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS. MINIMIZE THE AREA OF EXPOSED SOIL AT ANY ONE TIME. PHASING SHALL BE USED TO REDUCE THE AMOUNT AND DURATION OF SOIL EXPOSED TO THE ELEMENTS AND VEHICLE TRACKING.
  - 4.2. UTILIZE TEMPORARY MULCHING OR PROVIDE ALTERNATE TEMPORARY STABILIZATION ON EXPOSED SOILS IN ACCORDANCE WITH TABLE 1.
  - 4.3. THE MAXIMUM AMOUNT OF DISTURBED EARTH SHALL NOT EXCEED A TOTAL OF 5 ACRES FROM MAY 1<sup>st</sup> THROUGH NOVEMBER 30<sup>th</sup>, OR EXCEED ONE ACRE DURING WINTER MONTHS, UNLESS THE CONTRACTOR DEMONSTRATES TO THE DEPARTMENT THAT THE ADDITIONAL AREA OF DISTURBANCE IS NECESSARY TO MEET THE CONTRACTORS CRITICAL PATH METHOD SCHEDULE (CPM), AND THE CONTRACTOR HAS ADEQUATE RESOURCES AVAILABLE TO ENSURE THAT ENVIRONMENTAL COMMITMENTS WILL BE MET.
5. CONTROL STORMWATER FLOWING ONTO AND THROUGH THE PROJECT:
  - 5.1. DIVERT OFF SITE RUNOFF OR CLEAN WATER AWAY FROM THE CONSTRUCTION ACTIVITY TO REDUCE THE VOLUME THAT NEEDS TO BE TREATED ON SITE.
  - 5.2. DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM DISTURBED AREAS, SLOPES, AND AROUND ACTIVE WORK AREAS AND TO A STABILIZED OUTLET LOCATION.
  - 5.3. CONSTRUCT IMPERMEABLE BARRIERS AS NECESSARY TO COLLECT OR DIVERT CONCENTRATED FLOWS FROM WORK OR DISTURBED AREAS.
  - 5.4. STABILIZE, TO APPROPRIATE ANTICIPATED VELOCITIES, CONVEYANCE CHANNELS OR PUMPING SYSTEMS NEEDED TO CONVEY CONSTRUCTION STORMWATER TO BASINS AND DISCHARGE LOCATIONS PRIOR TO USE.
  - 5.5. DIVERT OFF-SITE WATER THROUGH THE PROJECT IN AN APPROPRIATE MANNER SO NOT TO DISTURB THE UPSTREAM OR DOWNSTREAM SOILS, VEGETATION OR HYDROLOGY BEYOND THE PERMITTED AREA.
6. PROTECT SLOPES:
  - 6.1. INTERCEPT AND DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM UNPROTECTED AND NEWLY ESTABLISHED AREAS AND SLOPES TO A STABILIZED OUTLET OR CONVEYANCE.
  - 6.2. CONSIDER HOW GROUNDWATER SEEPAGE ON CUT SLOPES MAY IMPACT SLOPE STABILITY AND INCORPORATE APPROPRIATE MEASURES TO MINIMIZE EROSION.
  - 6.3. CONVEY STORMWATER DOWN THE SLOPE IN A STABILIZED CHANNEL OR SLOPE DRAIN.
  - 6.4. THE OUTER FACE OF THE FILL SLOPE SHOULD BE IN A LOOSE RUFFLED CONDITION PRIOR TO TURF ESTABLISHMENT. TOPSOIL OR HUMUS LAYERS SHALL BE TRACKED UP AND DOWN THE SLOPE, DISKED, HARROWED, DRAGGED WITH A CHAIN OR MAT, MACHINE-RAKED, OR HAND-WORKED TO PRODUCE A RUFFLED SURFACE.
7. ESTABLISH STABILIZED CONSTRUCTION EXITS:
  - 7.1. INSTALL AND MAINTAIN CONSTRUCTION EXITS, ANYWHERE TRAFFIC LEAVES A CONSTRUCTION SITE ONTO A PUBLIC RIGHT-OF-WAY.
  - 7.2. SWEEP ALL CONSTRUCTION RELATED DEBRIS AND SOIL FROM THE ADJACENT PAVED ROADWAYS AS NECESSARY.
8. PROTECT STORM DRAIN INLETS:
  - 8.1. DIVERT SEDIMENT LADEN WATER AWAY FROM INLET STRUCTURES TO THE EXTENT POSSIBLE.
  - 8.2. INSTALL SEDIMENT BARRIERS AND SEDIMENT TRAPS AT INLETS TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE SYSTEM.
  - 8.3. CLEAN CATCH BASINS, DRAINAGE PIPES, AND CULVERTS IF SIGNIFICANT SEDIMENT IS DEPOSITED.
  - 8.4. DROP INLET SEDIMENT BARRIERS SHOULD NEVER BE USED AS THE PRIMARY MEANS OF SEDIMENT CONTROL AND SHOULD ONLY BE USED TO PROVIDE AN ADDITIONAL LEVEL OF PROTECTION TO STRUCTURES AND DOWN-GRADIENT SENSITIVE RECEPTORS.
9. SOIL STABILIZATION:
  - 9.1. WITHIN THREE DAYS OF THE LAST ACTIVITY IN AN AREA, ALL EXPOSED SOIL AREAS, WHERE CONSTRUCTION ACTIVITIES ARE COMPLETE, SHALL BE STABILIZED.
  - 9.2. IN ALL AREAS, TEMPORARY SOIL STABILIZATION MEASURES SHALL BE APPLIED IN ACCORDANCE WITH THE STABILIZATION REQUIREMENTS (SECTION 2.2) OF THE 2012 CGP. (SEE TABLE 1 FOR GUIDANCE ON THE SELECTION OF TEMPORARY SOIL STABILIZATION MEASURES.)
  - 9.3. EROSION CONTROL SEED MIX SHALL BE SOWN IN ALL INACTIVE CONSTRUCTION AREAS THAT WILL NOT BE PERMANENTLY SEEDED WITHIN TWO WEEKS OF DISTURBANCE AND PRIOR TO SEPTEMBER 15, OF ANY GIVEN YEAR. IN ORDER TO ACHIEVE VEGETATIVE STABILIZATION PRIOR TO THE END OF THE GROWING SEASON.
  - 9.4. SOIL TACKIFIERS MAY BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND REAPPLIED AS NECESSARY TO MINIMIZE SOIL AND MULCH LOSS UNTIL PERMANENT VEGETATION IS ESTABLISHED.
10. RETAIN SEDIMENT ON-SITE AND CONTROL DEWATERING PRACTICES:
  - 10.1. TEMPORARY SEDIMENT BASINS (CGP-SECTION 2.1.3.2) OR SEDIMENT TRAPS (ENV-WO 1506.10) SHALL BE SIZED TO RETAIN, ON SITE, THE VOLUME OF A 2-YEAR 24-HOUR STORM EVENT FOR ANY AREA OF DISTURBANCE OR 3,600 CUBIC FEET OF STORMWATER RUNOFF PER ACRE OF DISTURBANCE, WHICHEVER IS GREATER. TEMPORARY SEDIMENT BASINS USED TO TREAT STORMWATER RUNOFF FROM AREAS GREATER THAN 5-ACRES OF DISTURBANCE SHALL BE SIZED TO ALSO CONTROL STORMWATER RUNOFF FROM A 10-YEAR 24 HOUR STORM EVENT. ON-SITE RETENTION OF THE 10-YEAR 24-HOUR EVENT IS NOT REQUIRED.
  - 10.2. CONSTRUCT AND STABILIZE DEWATERING INFILTRATION BASINS PRIOR TO ANY EXCAVATION THAT MAY REQUIRE DEWATERING.
  - 10.3. TEMPORARY SEDIMENT BASINS OR TRAPS SHALL BE PLACED AND STABILIZED AT LOCATIONS WHERE CONCENTRATED FLOW (CHANNELS AND PIPES) DISCHARGE TO THE SURROUNDING ENVIRONMENT FROM AREAS OF UNSTABILIZED EARTH DISTURBING ACTIVITIES.

11. ADDITIONAL EROSION AND SEDIMENT CONTROL GENERAL PRACTICES:
  - 11.1. USE TEMPORARY MULCHING, PERMANENT MULCHING, TEMPORARY VEGETATIVE COVER, AND PERMANENT VEGETATIVE COVER TO REDUCE THE NEED FOR DUST CONTROL. USE MECHANICAL SWEEPERS ON PAVED SURFACES WHERE NECESSARY TO PREVENT DUST BUILDUP. APPLY WATER, OR OTHER DUST INHIBITING AGENTS OR TACKIFIERS, AS APPROVED BY THE NHDES.
  - 11.2. ALL STOCKPILES SHALL BE CONTAINED WITH TEMPORARY PERIMETER CONTROLS. INACTIVE SOIL STOCKPILES SHOULD BE PROTECTED WITH SOIL STABILIZATION MEASURES (TEMPORARY EROSION CONTROL SEED MIX AND MULCH, SOIL BINDER) OR COVERED WITH ANCHORED TARPS.
  - 11.3. EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSPECTED IN ACCORDANCE WITH SECTION 645 OF NHDOT SPECIFICATIONS, WEEKLY AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.25 IN. OF RAIN PER 24-HOUR PERIOD. EROSION AND SEDIMENT CONTROL MEASURES WILL ALSO BE INSPECTED IN ACCORDANCE WITH THE GUIDANCE MEMO FROM THE NHDES CONTAINED WITHIN THE CONTRACT PROPOSAL AND THE EPA CONSTRUCTION GENERAL PERMIT.
  - 11.4. THE CONTRACTOR SHOULD UTILIZE STORM DRAIN INLET PROTECTION TO PREVENT SEDIMENT FROM ENTERING A STORM DRAINAGE SYSTEM PRIOR TO THE PERMANENT STABILIZATION OF THE CONTRIBUTING DISTURBED AREA.
  - 11.5. PERMANENT STABILIZATION MEASURES WILL BE CONSTRUCTED AND MAINTAINED IN LOCATIONS AS SHOWN ON THE CONSTRUCTION PLANS TO STABILIZE AREAS. VEGETATIVE STABILIZATION SHALL NOT BE CONSIDERED PERMANENTLY STABILIZED UNTIL VEGETATIVE GROWTH COVERS AT LEAST 85% OF THE DISTURBED AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EROSION AND SEDIMENT CONTROL FOR ONE YEAR AFTER PROJECT COMPLETION.
  - 11.6. CATCH BASINS: CARE SHALL BE TAKEN TO ENSURE THAT SEDIMENTS DO NOT ENTER ANY EXISTING CATCH BASINS DURING CONSTRUCTION. THE CONTRACTOR SHALL PLACE TEMPORARY STONE INLET PROTECTION OVER INLETS IN AREAS OF SOIL DISTURBANCE THAT ARE SUBJECT TO SEDIMENT CONTAMINATION.
  - 11.7. TEMPORARY AND PERMANENT DITCHES SHALL BE CONSTRUCTED, STABILIZED AND MAINTAINED IN A MANNER THAT WILL MINIMIZE SCOUR. TEMPORARY AND PERMANENT DITCHES SHALL BE DIRECTED TO DRAIN TO SEDIMENT BASINS OR STORM WATER COLLECTION AREAS.
  - 11.8. WINTER EXCAVATION AND EARTHWORK ACTIVITIES NEED TO BE LIMITED IN EXTENT AND DURATION, TO MINIMIZE POTENTIAL EROSION AND SEDIMENTATION IMPACTS. THE AREA OF EXPOSED SOIL SHALL BE LIMITED TO ONE ACRE, OR THAT WHICH CAN BE STABILIZED AT THE END OF EACH DAY UNLESS A WINTER CONSTRUCTION PLAN, DEVELOPED BY A QUALIFIED ENGINEER OR A CPESC SPECIALIST, IS REVIEWED AND APPROVED BY THE DEPARTMENT.
  - 11.9. CHANNEL PROTECTION MEASURES SHALL BE SUPPLEMENTED WITH PERIMETER CONTROL MEASURES WHEN THE DITCH LINES OCCUR AT THE BOTTOM OF LONG FILL SLOPES. THE PERIMETER CONTROLS SHALL BE INSTALLED ON THE FILL SLOPE TO MINIMIZE THE POTENTIAL FOR FILL SLOPE SEDIMENT DEPOSITS IN THE DITCH LINE.

## BEST MANAGEMENT PRACTICES (BMP) BASED ON AMOUNT OF OPEN CONSTRUCTION AREA

12. STRATEGIES SPECIFIC TO OPEN AREAS LESS THAN 5 ACRES:
  - 12.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WO 1500; ALTERATION OF TERRAIN FOR CONSTRUCTION AND USE ALL CONVENTIONAL BMP STRATEGIES.
  - 12.2. SLOPES STEEPER THAN 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING.
  - 12.3. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT ALONE.
  - 12.4. AREAS WHERE HAUL ROADS ARE CONSTRUCTED AND STORMWATER CANNOT BE TREATED THE DEPARTMENT WILL CONSIDER INFILTRATION.
  - 12.5. FOR HAUL ROADS ADJACENT TO SENSITIVE ENVIRONMENTAL AREAS OR STEEPER THAN 5%, THE DEPARTMENT WILL CONSIDER USING EROSION STONE, CRUSHED GRAVEL, OR CRUSHED STONE BASE TO HELP MINIMIZE EROSION ISSUES.
  - 12.6. ALL AREAS THAT CAN BE STABILIZED SHALL BE STABILIZED PRIOR TO OPENING UP NEW TERRITORY.
  - 12.7. DETENTION BASINS SHALL BE DESIGNED AND CONSTRUCTED TO ACCOMMODATE A 2 YEAR STORM EVENT.
13. STRATEGIES SPECIFIC TO OPEN AREAS BETWEEN 5 AND 10 ACRES:
  - 13.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WO 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES WILL BE UTILIZED.
  - 13.2. DETENTION BASINS WILL BE CONSTRUCTED TO ACCOMMODATE THE 2-YEAR 24-HOUR STORM EVENT AND CONTROL A 10-YEAR 24-HOUR STORM EVENT.
  - 13.3. SLOPES STEEPER THAN A 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS. OTHER ALTERNATIVE MEASURES, SUCH AS BONDED FIBER MATRIXES (BFMS) OR FLEXIBLE GROWTH MEDIUMS (FGMS) MAY BE UTILIZED, IF MEETING THE NHDES APPROVALS AND REGULATIONS.
  - 13.4. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS.
14. STRATEGIES SPECIFIC TO OPEN AREAS OVER 10 ACRES:
  - 14.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WO 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES AND BETWEEN 5 AND 10 ACRES WILL BE UTILIZED.
  - 14.2. THE DEPARTMENT ANTICIPATES THAT SOIL BINDERS WILL BE NEEDED ON ALL SLOPES STEEPER THAN 3:1, IN ORDER TO MINIMIZE EROSION AND REDUCE THE AMOUNT OF SEDIMENT IN THE STORMWATER TREATMENT BASINS.
  - 14.3. THE CONTRACTOR WILL BE REQUIRED TO HAVE AN APPROVED DESIGN IN ACCORDANCE WITH ENV-WO 1506.12 FOR AN ACTIVE FLOCCULANT TREATMENT SYSTEM TO TREAT AND RELEASE WATER CAPTURED IN STORM WATER BASINS. THE CONTRACTOR SHALL ALSO RETAIN THE SERVICES OF AN ENVIRONMENTAL CONSULTANT WHO HAS DEMONSTRATED EXPERIENCE IN THE DESIGN OF FLOCCULANT TREATMENT SYSTEMS. THE CONSULTANT WILL ALSO BE RESPONSIBLE FOR THE IMPLEMENTATION AND MONITORING OF THE SYSTEM.

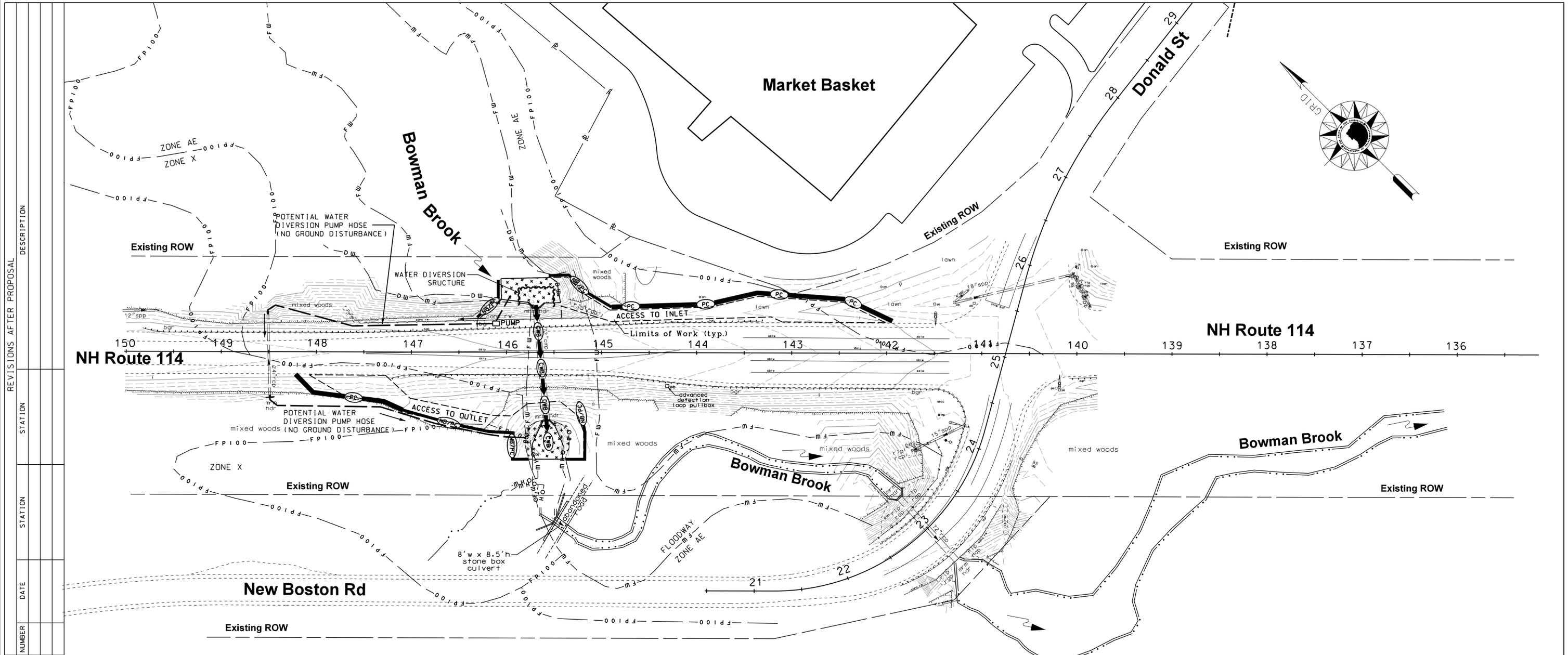
TABLE 1  
GUIDANCE ON SELECTING TEMPORARY SOIL STABILIZATION MEASURES

APPLICATION AREAS	DRY MULCH METHODS				HYDRAULICALLY APPLIED MULCHES <sup>2</sup>				ROLLED EROSION CONTROL BLANKETS <sup>3</sup>			
	HMT	WC	SG	CB	HM	SMM	BFM	FRM	SNSB	DNSB	DNCSB	DNCB
SLOPES <sup>1</sup>												
STEEPER THAN 2:1	NO	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO	YES
2:1 SLOPE	YES	YES	YES	YES	NO	NO	YES	YES	NO	YES	YES	YES
3:1 SLOPE	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	NO
4:1 SLOPE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
WINTER STABILIZATION	4T/AC	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES
CHANNELS												
LOW FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES
HIGH FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES

ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE
HMT	HAY MULCH & TACK	HM	HYDRAULIC MULCH	SNSB	SINGLE NET STRAW BLANKET
WC	WOOD CHIPS	SMM	STABILIZED MULCH MATRIX	DNSB	DOUBLE NET STRAW BLANKET
SG	STUMP GRINDINGS	BFM	BONDED FIBER MATRIX	DNCSB	2 NET STRAW-COCONUT BLANKET
CB	COMPOST BLANKET	FRM	FIBER REINFORCED MEDIUM	DNCB	2 NET COCONUT BLANKET

- NOTES:
1. ALL SLOPE STABILIZATION OPTIONS ASSUME A SLOPE LENGTH  $\leq 10$  TIMES THE HORIZONTAL DISTANCE COMPONENT OF THE SLOPE, IN FEET.
  2. PRODUCTS CONTAINING POLYACRYLAMIDE (PAM) SHALL NOT BE APPLIED DIRECTLY TO OR WITHIN 100 FEET OF ANY SURFACE WATER WITHOUT PRIOR WRITTEN APPROVAL FROM THE NH DEPARTMENT OF ENVIRONMENTAL SERVICES.
  3. ALL EROSION CONTROL BLANKETS SHALL BE MADE WITH WILDLIFE FRIENDLY BIODEGRADABLE NETTING.

STATE OF NEW HAMPSHIRE				
BEDFORD				
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN				
<i>EROSION CONTROL STRATEGIES</i>				
REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
12-21-2015	43276erosstrat	43138	6	7



REVISIONS AFTER PROPOSAL	DESCRIPTION
STATION	
STATION	
DATE	
NUMBER	

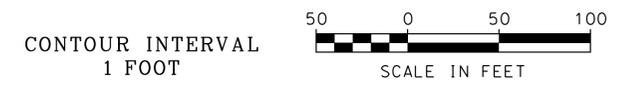
SDR PROCESSED	SEL	DATE	6/2021
NEW DESIGN	CAC	DATE	9/2021
SHEET CHECKED	JUN	DATE	10/2021
AS BUILT DETAILS		DATE	

EROSION CONTROL PLAN LEGEND	
	PERIMETER CONTROL
	SILT FENCE
	EROSION CONTROL MIX BERM
	EROSION CONTROL MIX SOX
	TURBIDITY CURTAIN
	SHEET PILE
	COFFER DAM
	NATURAL BUFFER/PERIMETER CONTROL
	SILT FENCE
	EROSION CONTROL MIX BERM
	EROSION CONTROL MIX SOX
	TURBIDITY CURTAIN
	SHEET PILE
	COFFER DAM
	CHANNEL PROTECTION
	STONE CHECK DAMS
	STRAW WATTLES
	CHANNEL MATTING
	CLASS D EROSION STONE
	CLASS C STONE
	CLEAN WATER BYPASS
	PUMP THROUGH PIPE
	DRAIN THROUGH PIPE OR CHANNEL

**GENERAL NOTES:**

- 1) A Water Diversion Item will be included in the Contract for managing surface water. Stream flow shall be passed through or around the work area by an approved method. At a minimum, the Water Diversion shall be designed to accommodate a 2 year storm.
- 2) Clean water bypass may need to be routed around the existing 72" cmp for a few days during insertion and curing of the liner. A potential pump and hose layout is shown.
- 2) Dewatering discharge may be to sediment bags located within the ROW, with appropriate offset to wetlands.
- 3) Water diversion and dewatering details shown are approximate. Final type / size / location shall be per the Contractor's approved SWPPP.

STA 145+65  
 REHABILITATE EXISTING 72" X 119' LONG CORRUGATED METAL CULVERT:  
 SLIPLINE 119 LF OF 72" CMP WITH CURED IN PLACE LINER.  
 REPAIR MRM INLET AND OUTLET HEADWALLS.  
 REPAIR SINKHOLES BEHIND INLET HEADWALL.  
 CONSTRUCT AND REMOVE TEMPORARY ACCESS ROADS TO INLET AND OUTLET.  
 RESTORE DISTURBED AREAS TO EXISTING CONDITIONS. USE WETLAND SEED MIX TO RESTORE JURISDICTIONAL WETLAND AREAS.  
 NO PERMANENT CHANGE TO TOPOGRAPHY, NO PROPOSED CONTOURS.



SEE PROFILE FOR CULVERT SLOPE AND INVERTS			
STATE OF NEW HAMPSHIRE BEDFORD			
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN			
<b>WETLAND IMPACT PLAN</b>			
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43138ercplan	43138	7	7